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CFR 47, PART 87

TYPE ACCEPTANCE REPORT

FOR THE

COMMUNICATIONS TRANSCEIVER SYSTEM

MODEL: **CTX-1000**

FCC ID: NVSCTX-1000 (PENDING)

PREPARED FOR:

Cubic Communications, Inc.
9535 Waples Street
San Diego, CA 92121-2953

PREPARED ON:

APRIL 13, 1998

REPORT NUMBER 98-046

This report has been prepared in accordance with all applicable requirements of ANSI C63.4-1992

Electromagnetic Engineering Services, Inc.		11696 Sorrento Valley Road, Suite. F, San Diego, CA 92121 (619) 259-4940 Voice (619) 259-7170 Fax			
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DOCUMENT HISTORY

Revision	Date	Comments
A	4/13/98	Initial Release T. B. Ketterling

NOTE: EESI hereby makes the following statements so as to conform to Chapter 10 (Test Reports) Requirements of ANSI C63.4 (1992) "Methods and Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz":

- The units described in this report were received at EESI's facilities on December 10, 1997. Testing was performed on the units described in this report December 10, 1997 – February 11, 1998.
- The Test Results reported herein apply only to the Units actually tested, and to substantially identical Units.

This Report is the property of EESI, and shall not be reproduced, except in full, without prior written approval of EESI. However, all ownership rights are hereby returned unconditionally to Cubic Communications, Inc., and approval is hereby granted to Cubic Communications, Inc. and its employees and agents to reproduce all or part of this report for any legitimate business purpose without further reference to EESI.

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CERTIFICATION

The Radio Frequency Interference (RFI) testing, data evaluation and this report have been prepared by Electromagnetic Engineering Services, Inc., an independent electromagnetic compatibility consulting and test laboratory.

The testing and data collection was accomplished in accordance with the requirements of the ANSI, C63.4-1992 standard and the applicable sections of CFR 47 Parts 2, 15 and 87 for intentionally radiating equipment. Refer to the Administrative Summary for a description of the test sample.

I certify the data, data evaluation and equipment configuration herein to be a true and accurate representation of the sample's radio frequency interference emission characteristics, as of the test date(s), and for the design of the test sample utilized to compile this report.

T. Bruce Ketterling
VP for Technical Operations

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1. ADMINISTRATIVE DATA AND TEST SUMMARY

1.1 Administrative Data

CLIENT: Cubic Communications, Inc.
9535 Waples Street
San Diego, CA 92121-2953
(619) 643-5873
(619) 643-5803 - fax

CONTACT: Curtis D. Riley / Michael Norman

DATE(S) OF TEST: December 10, 1997 – February 11, 1998

TEST SPECIFICATION: CFR 47, Part 87, for intentional radiators
CFR 47, Part 15B, Class "A" for unintentional radiators (Receive Mode) *

EQUIPMENT UNDER TEST: The CTX-1000 Communication Transceiver System is comprised of the following devices:

<i>Component</i>	<i>Model Number</i>
Exciter	T-4180
Power Amplifier	PA-5050A
Power Supply	PS-7130A

NOTE: The EUT is a system that can operate in either J3E or H3E mode (as defined in CFR 47) and at variable frequencies from 1.6 MHz up to 30 MHz. The EUT was tested at the following frequencies as representative in their associated band:

2 MHz
3 MHz
4 MHz
6 MHz
8.5 MHz
12 MHz
17 MHz
24.9 MHz

*In addition, the EUT was tested in Receive-only mode to Part 15B Class "A" limits. Representative data has been provided in this report as information items.

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1.2 Tests Performed

The purpose of these tests is to verify compliance with the FCC requirements of CFR 47, Part 87.131, for aeronautical fixed base station operation. The modes of operation are Continuous Wave (CW), H3E and J3E. The following chart lists the specific tests performed and the test results.

<i>Specification</i>	<i>Frequency Range</i>	<i>Compliance Status</i>
FCC CFR 47, §15.107 Conducted Emissions for Intentional Radiators	0.45 MHz - 30.00 MHz	PASS
FCC CFR 47, §15.109 Radiated Emissions for Intentional Radiators	30.00 MHz - 1000 MHz	PASS
FCC CFR 47 Part 87, Subpart D, §2.985 RF Power Output	2-25 MHz (using the transmitter frequencies listed on the previous page)	PASS
FCC CFR 47 Part 87, Subpart D, §2.987 Modulation Characteristics	2-25 MHz (using the transmitter frequencies listed on the previous page)	PASS
FCC CFR 47 Part 87, Subpart D, §2.989 Occupied Bandwidth	2-25 MHz (using the transmitter frequencies listed on the previous page)	PASS
FCC CFR 47 Part 87, Subpart D, §2.991 Spurious Emissions	2-25 MHz (using the transmitter frequencies listed on the previous page)	PASS
FCC CFR 47 Part 87, Subpart D, §2.993 Field Strength Measurements	2-25 MHz (using the transmitter frequencies listed on the previous page)	PASS
FCC CFR 47 Part 87, Subpart D, §2.995 Frequency Stability	2-25 MHz (using the transmitter frequencies listed on the previous page)	PASS

T. Bruce Ketterling, EESI

Please refer to the Test Results section of this report for further details.

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2. DESCRIPTION OF EUT

The CTX-1000 system is a communications transceiver consisting of the following three components:

1. PA-5050A MF/HF Power Amplifier
2. PS-7130A Power Supply
3. T-4180 Exciter

The PA-5050A linear power amplifier is a solid state unit that provides 1 kilowatt power amplification of RF signals between 1.6 and 30 MHz. The unit contains 4 independent power amplifier (PA) modules. If one or more of the PA modules fail, the unit will still operate with reduced power out.

The front panel contains a PWR LED with each PA module containing an individual PWR and FLT LED, and a multifunction display. Input power to the PA-5050A is derived from a separate +28VDC power supply providing five separate +28VDC outputs. Four independent modular PA modules provide the four stages of amplification. Each PA module is identical and interchangeable. When an individual PA module's gain is less than +10dB, the circuitry turns on the FLT LED. The individual module can then be removed and replaced.

The rear panel contains four connectors for the transmitter/exciter low power RF input, high power RF output to the antenna, remote control input and output, DC power and signal input, and a ground lug.

Four internal fans per PA module provide cooling across the heatsink of the unit.

The PS-7130A Power Supply provides four independent regulated +28VDC voltages at 30 amperes and one +28VDC voltage at 11 amperes using 160 to 264 volts, 50/60 Hz, single phase AC input power. The PS-7130A is normally used to supply power to the CCI PA-5050A power amplifier.

The front panel contains a PWR LED indicating when input power is on and a switch/circuit breaker to apply input power and protect the equipment. Four independent modular power supplies provide the five +28VDC outputs. The four power supply modules are identical and interchangeable. The front panel contains individual PS lamps indicating the +28VDC output is present.

The rear panel contains connectors for power and signal outputs, AC power input, and chassis grounding.

Two internal cooling fans provide ambient airflow through the unit in addition to the fans in each modular power supply.

The T-4180 is a multi-mode digital signal processing (DSP) exciter with a frequency range from 1.6 to 30MHz.

The exciter contains individually shielded modules mounted in an 8½ by 3½-inch desktop chassis. Two T-4180 exciters may be fastened together (using an optional dual rack-mount kit) to construct a standard 19-inch rack mount configuration.

A 19-button keypad and main adjustment knob used to select the exciter parameters control the exciter. Five "soft keys" work in conjunction with the vacuum fluorescent digital display immediately above the soft keys. In addition to soft key selections, the vacuum fluorescent digital display provides a variety of data including channel, modulation mode, frequency, bandwidth, gain, local/remote control, a RF level meter, and an AF level meter. Additional information is displayed depending on soft key selections.

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The manufacturer's documentation specifies that the exciters can generate the following signals:

- On/Off keyed (CW)
- Amplitude Modulated (AM)
- Upper Sideband (USB)
- Upper Sideband – Full Carrier (USBfc)
- Upper Sideband – Partial Carrier (USBpc)
- Lower Sideband (LSB)
- Lower Sideband – Full Carrier (LSBfc)
- Lower Sideband – Partial Carrier (LSBpc)
- Independent Sideband (ISB) – Suppressed carrier and independent
- Frequency Shift Keyed (FSK)
- Frequency Modulation (FM)
- Frequency Modulation Facsimile (FMfax)

The selected audio input is provided on a 600 Ω balanced line. Normal and alternate (LSB audio when ISB is selected) audio are simultaneously input on separate 600 Ω balanced lines.

A MIC/KEY jack on the front panel provides for connection of an external microphone or CW key. The audio level is automatic. The audio is automatically applied to the correct modulator depending on the modulation mode. However, when ISB modulation is selected the microphone is directed to the normal audio channel only.

Either an internal (OCXO) or external reference frequency may be used. The external reference frequency is automatically sensed and used when connected to the rear panel.

The exciters may be remotely controlled by any suitable bus controller using a serial interface bus, RS-232 or RS-422, or an IEEE-488 parallel interface bus.

3. DESIGN MODIFICATIONS FOR COMPLIANCE

Device: Cubic Communications, Inc. Exciter and Power Amplifier

Model: T-4180 and PA-5050A

No design modifications were made to this unit during testing.

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4. SYSTEM CONFIGURATION

4.1 System Configuration and Power Cables

DEVICE	MANUFACTURER MODEL # SERIAL #	POWER AND I/O CABLE
EUT: Exciter	Cubic Communications, Inc. T-4180 N/A	(To 120V AC Power): 2.5m, unshielded, 12 AWG, 4-wire, 4-pin circular screw-type connector
EUT: Power Amplifier	Cubic Communications PA-5050A N/A	(To DC Power Supply): 1m, shielded, 10 AWG, 10-wire, 10-pin circular locking connector (MS3476L24-19P)
EUT: Power Supply	Cubic Communications PS-7130A N/A	(To 208V AC Power): 2m, unshielded, 18 AWG, 3-wire, IEC connectors
Signal Generator	Hewlett Packard 3326A Two Channel Synthesizer 2Y37A00156	2m, unshielded, 18 AWG, 3-wire, IEC connectors
Attenuator	Bird 2kW 30dB 8329-300 4414	5m, unshielded, 18 AWG, 3-wire, IEC connectors
Dummy Load	Bird 200W DA-139/URM 1099	N/A

NOTE: 5/8" tubular grounding straps were attached between the Power Amplifier, Power Supply, and Exciter. This grounding strap was then connected to an Earth ground at a 1m distance.

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4.2 Device Interconnection and I/O Cables

CONNECTION	I/O CABLE
EUT (Power Amplifier) to Attenuator	8m, shielded, RG8/U, N connectors
Attenuator to Dummy Load	1m, shielded, RG142B/U, BNC connectors with 50 Ω termination
EUT (Exciter) to Signal Generator	7m, shielded, RG58A/U, BNC to DB15 connector
EUT (Power Amplifier J1 Input) to EUT (Exciter J3 Output)	1m, shielded, RG-142B/U, N connectors with BNC adapters
EUT (Power Amplifier J4 Sense) to EUT (Power Supply Sense)	0.75m, shielded, 24 AWG, DB15 to DB25 connectors
EUT (Power Amplifier J5 Control) to EUT (Exciter J5 PA Control)	0.75m, shielded, 24 AWG, DB15 connectors

4.3 Procedure for Exercising EUT

For transmit mode, the EUT was connected to a power attenuator and a dummy load and set to radiate at one frequency at a time in each band from 2 MHz to 25 MHz. Either a microphone input or line input was connected to the signal source and the input voltage was varied as required in specific tests listed below. The output of the Power Amplifier was measured as required in the following tests.

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5. DESCRIPTION OF TESTING METHODS

5.1 Introduction

As required in 47 CFR, Parts 15 and 87, the methods employed to test the radiated and conducted emissions (as applicable) of the EUT are those contained within the American National Standards Institute (ANSI) document C63.4-1992, titled "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz." All applicable FCC Rule Sections that provide further guidance for performance of such testing are also observed.

For General Test Configuration please refer to Figure #1 on page 11.

5.2 Part 15 Test Descriptions

5.2.1 Configuration and Methods of Measurements for Conducted Emissions

Section 7 of ANSI C63.4 determines the general configuration of the EUT and associated equipment, as well as the test platform for conducted emissions testing. Tabletop devices are placed on a non-conducting surface 80 centimeters above the ground plane floor and 40 centimeters from the ground plane wall. The EUT and associated system are configured to operate continuously, representing a "normally operating" mode. The emissions are recorded using the required bandwidth of 9 kHz in the quasi-peak mode. The average amplitude is also observed employing a 10 Hz bandwidth to determine the presence of broadband RFI. When such interference is caused by broadband sources (as defined by the FCC and ANSI Rules), the deviation guidelines contained in Section 11.3.1 of ANSI C63.4 are employed, which allows a correction factor of 13 dB to be subtracted from the quasi-peak reading. The emission levels are then compared to the applicable FCC limits to determine compliance.

For Conducted Emissions Test Configuration please refer to Figure #2 on page 12.

5.2.2 Configuration for Determining Location of Maximum Radiated Emissions

Section 8 of ANSI C63.4 determines the general configuration and procedures for measuring the radiated emissions of equipment under test. Initially, the primary emission frequencies are identified inside the test lab by positioning a broadband receive antenna one meter from the EUT to locate frequencies of significant radiation. Normally this is done inside a shielded or shielded, anechoic chamber to eliminate ambients. Next, the EUT and associated system are placed on a turntable on an open area test site (registered with the FCC in accord with its Rules and ANSI C63.4) and the receive antenna is located at a distance of ten or three meters from the EUT.

The EUT and associated system are configured to operate in a continuous transmitting mode, representing a "normally operating" mode. To ensure that the maximum emission at each discrete frequency of interest is observed, the receive antenna is varied in height from one to four meters and rotated to produce horizontal and vertical polarities, and the turntable is also rotated to determine the worst emitting configuration.

For Frequency ID and Radiated Emissions test configuration please refer to Figures #3 and #4 on pages 13-14.

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5.3 FCC Part 87 Test Descriptions

FCC CFR 47 Part 87, Subpart D, and Part 2, sections §2.985, §2.987, §2.989, §2.991, §2.993 and §2.995 specify the general emission specification limits and several specific parameter measures for high power transmitters. Compliance to the specific sections is listed below.

5.3.1 RF Power Output

The device under test is a single-sideband transmitter operating in either the H3E mode or the J3E mode. Maximum peak envelope power output is limited to 6 kW measured at the RF output terminals. A 30 dB power attenuator and a 200 W load are placed on the RF output terminals. A 1500 Hz tone is used as the modulating signal in H3E mode and both a 400 Hz and an 1800 Hz signal are used in the J3E mode. The device under test does not exceed 6 kW peak output power as specified in §87.131. This complies with the requirements of this section.

5.3.2 Modulation Characteristics

Data representing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz is included in this report in accordance with §2.987. Additionally, data representing the peak envelope power output versus the modulation input voltage (as specified in the Occupied Bandwidth test) is also provided. This reflects the requirements of §2.987. The provisions of this section are met. The relationships of carrier power to peak power of §87.141 are met.

5.3.3 Occupied Bandwidth

§87.139(c) specifies that the peak envelope power of any emission must be within the limits contained in paragraphs (1) through (3) relative to the assigned frequency. The requirements of this section are met.

5.3.4 Spurious Emissions

At rated output power, while transmitting a modulated single carrier, the composite spurious and noise output shall be attenuated below the mean power of the transmitter by at least 60 dB as specified in §87.139(c)(3). This attenuation is expressed in dB below the carrier referenced to a 4 kHz bandwidth and relative to the maximum emission envelope level. The provisions of this section are met.

5.3.5 Field Strength Measurements

Field strength emissions are measured on an open area test site in accordance with §2.993. The device under test is also compared to FCC Class "A" limits. The provisions of this section are met.

5.3.6 Frequency Stability

§2.995 requires that the device under test maintain a 20 Hz tolerance of frequency stability with variation of ambient temperature (-30°C to +50°C) as well as with variation of supply voltage (85% to 115% of V_{nom}). The provisions of this section are met.

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6. DESCRIPTION OF TEST SITE

The test site is located at:

11696 Sorrento Valley Road, Suite F
San Diego, CA 92121

This 11 x 17 meter open area test site is located behind the office/lab building. It conforms to the normalized site attenuation limits and construction specifications as set in the EN55022 (1987), CISPR 16 and 22 (1985) and ANSI C63.4-1992 documents. The site attenuation characteristics are verified for compliance every three years and was last registered with the Federal Communications Commission on October 21, 1996, FCC Document Number 31040/SIT (1300B3). The test site is physically located 18 miles Northwest of downtown San Diego. The general area is a valley 1.5 miles east of the Pacific Ocean. This particular part of the valley tends to minimize ambient levels, i.e. radio and TV broadcast stations and land mobile communications.

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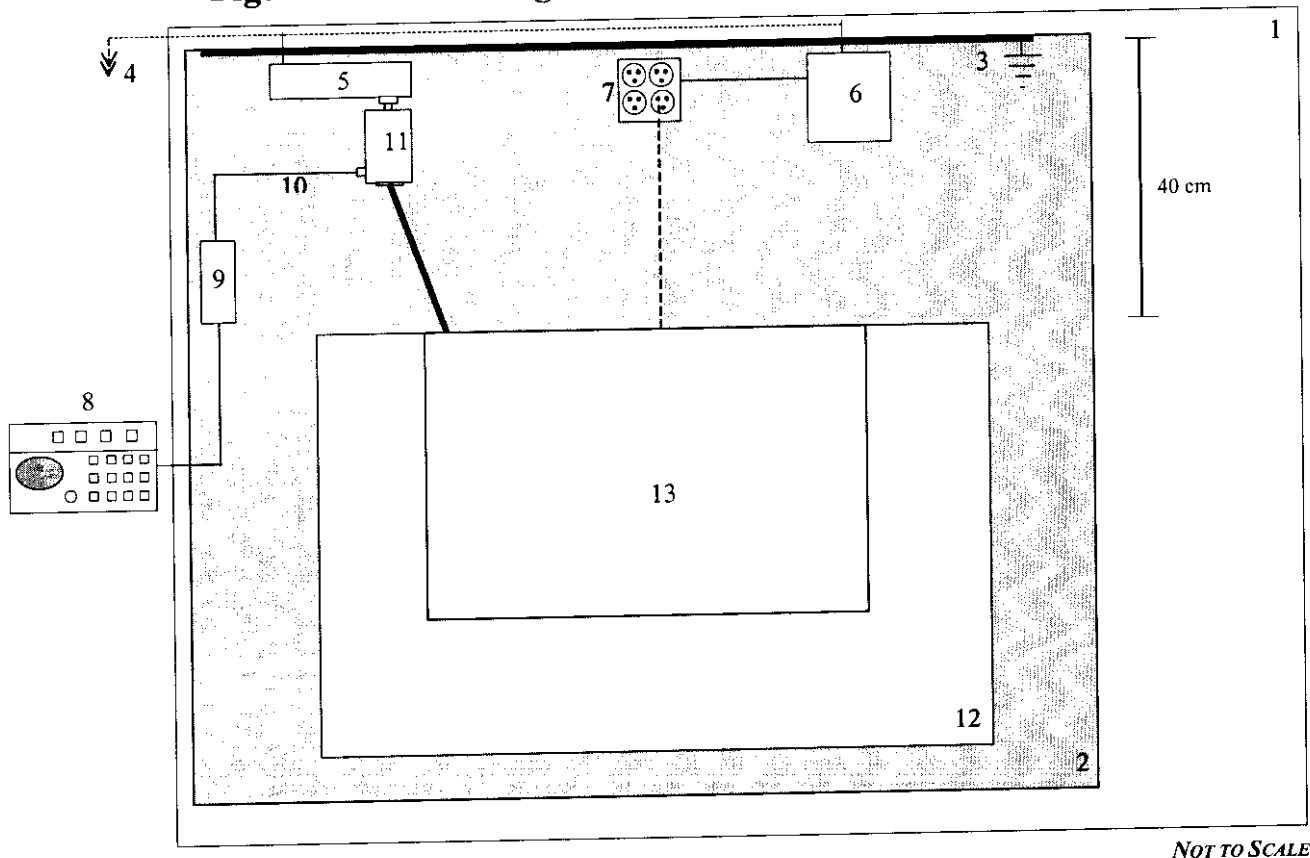
7. TEST EQUIPMENT

The following test equipment were used to collect data for this report. All devices used were of current calibration and of the type required in the applicable document section of this report.

EQUIPMENT	MODEL #
<i>Spectrum Analyzer System:</i>	
Quasi Peak Adapter	HP 85650A
Spectrum Analyzer	HP 8566B
RF Preselector	HP 85685A
Field Intensity Probe Set	Electrometrics EM4422
Power Line filter	Lindgren C-150-30-2
Line Impedance Stabilization Network (LISN)	EMCO 3825/2
Line Impedance Stabilization Network (LISN)	EMCO 8602-50-TS-50-N
High pass filter	Solar Electronics 7801-5.0
Ridged Guide Antenna, Xmit	Electrometrics RGA-25
Biconical Antenna, Xmit	EMCO 3101
Biconical Antenna	EMCO 3104
Log Periodic Antenna	Electrometrics LPA-25
Amplifier	Mini-Circuits, Amplifier ZHL-2 (SMA),
Power Source, AC	Elgar 2751 w/ series 400V variable frequency/ voltage oscillator
Multimeter	Fluke 77
Multimeter	Goldstar DM-9183
Electronic Counter	Hewlett Packard HP 5244L
Temperature/Humidity Chamber	Thermotron Industries SM-32S-SH
Limiter	Cubic provided
Directional Coupler	Cubic provided
Power Attenuator	Cubic provided
Terminating Dummy Load	Cubic provided 200W 50Ω
Power Meter	Client provided

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Figure 2: Test Configuration, Conducted Emissions



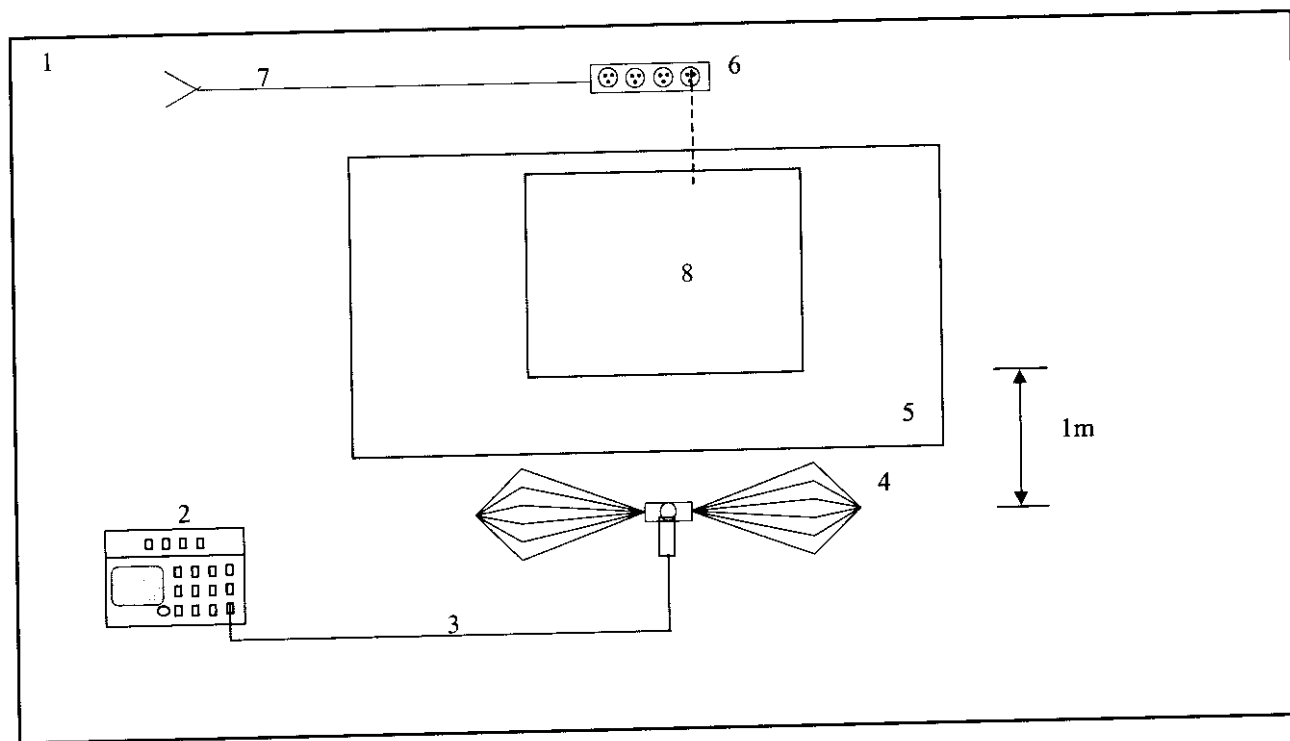
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CONFIGURATION LEGEND

1. Test Laboratory (6 X 6 meters)
2. Ground Plane (15 square meters)
3. Vertical Conducting Wall (Grounded through Ground Plane via 10' ground rod)
4. AC Power for Devices (120V/208V, 60 cycles, single phase)
5. Power Line Filter, Lindgren, 120 dB, 30 amp
6. Line Impedance Stabilization Network (LISN) for peripheral devices
7. Power Distribution Box for peripheral devices
8. Spectrum Analyzer with Quasi-Peak Adapter
9. High Pass Filter
10. Coax input from EUT LISN to Spectrum Analyzer
11. LISN for EUT
12. Non-Conducting table 80 cm above ground plane
13. EUTs and associated system

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Figure 3. Test Configuration, Frequency Identification of Radiated Emissions



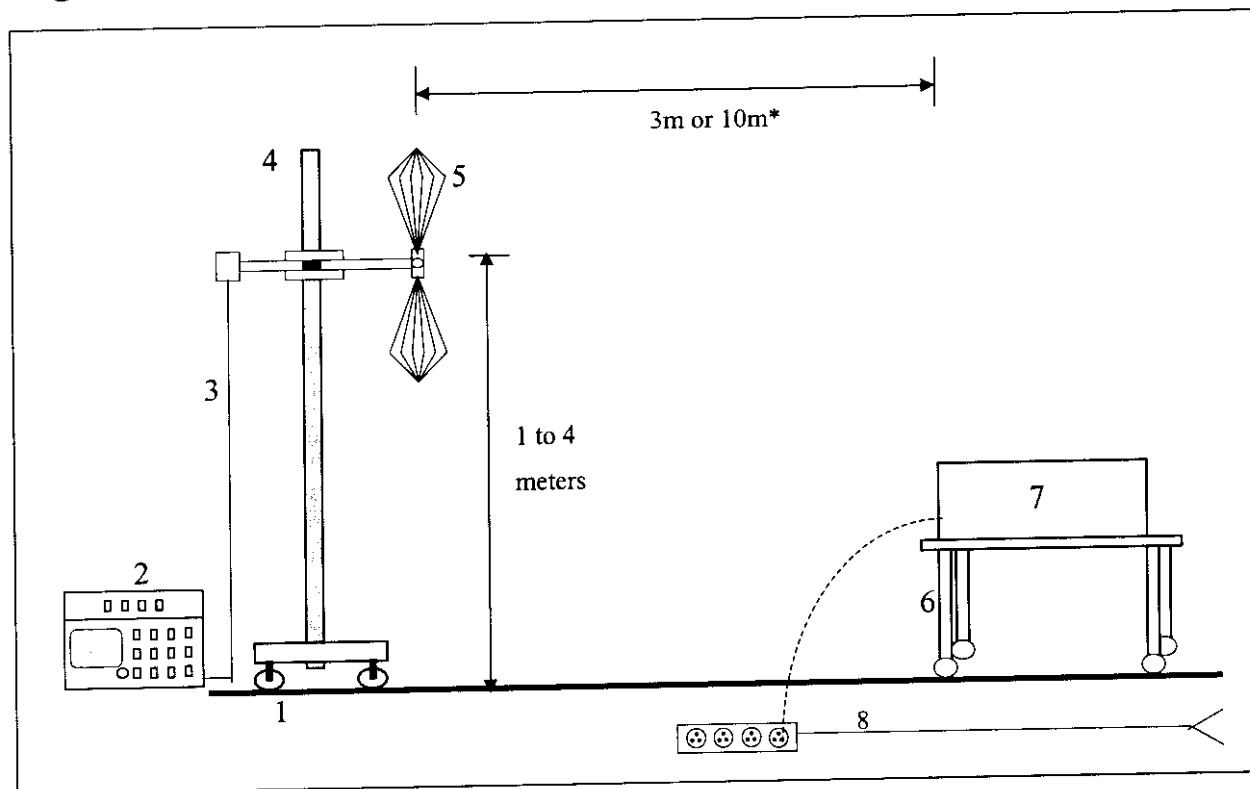
NOT TO SCALE

CONFIGURATION LEGEND

1. Test Laboratory
2. Spectrum Analyzer with Quasi-Peak Adapter
3. Coax interconnect from Antenna to Spectrum Analyzer
4. Receive Antenna (basic relative position)
5. Non-Conducting table 80 cm above ground plane
6. Power strip for EUT and peripherals
7. AC power for devices (120V/208V, 60 cycles, single phase)
8. EUTs and Associated System

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Figure 4: Test Configuration, Radiated Emissions, 10-Meter Open Field Site



NOT TO SCALE

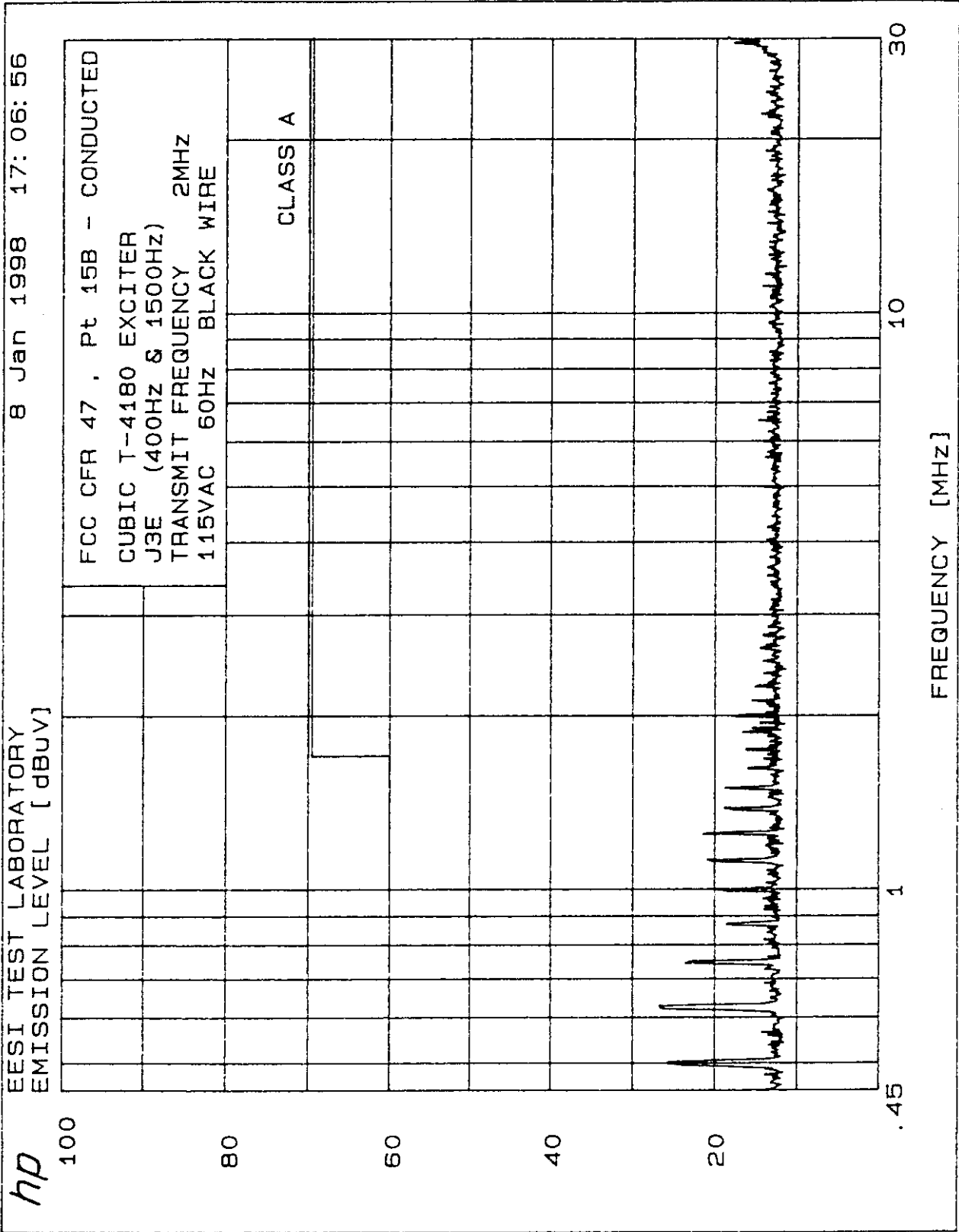
CONFIGURATION LEGEND

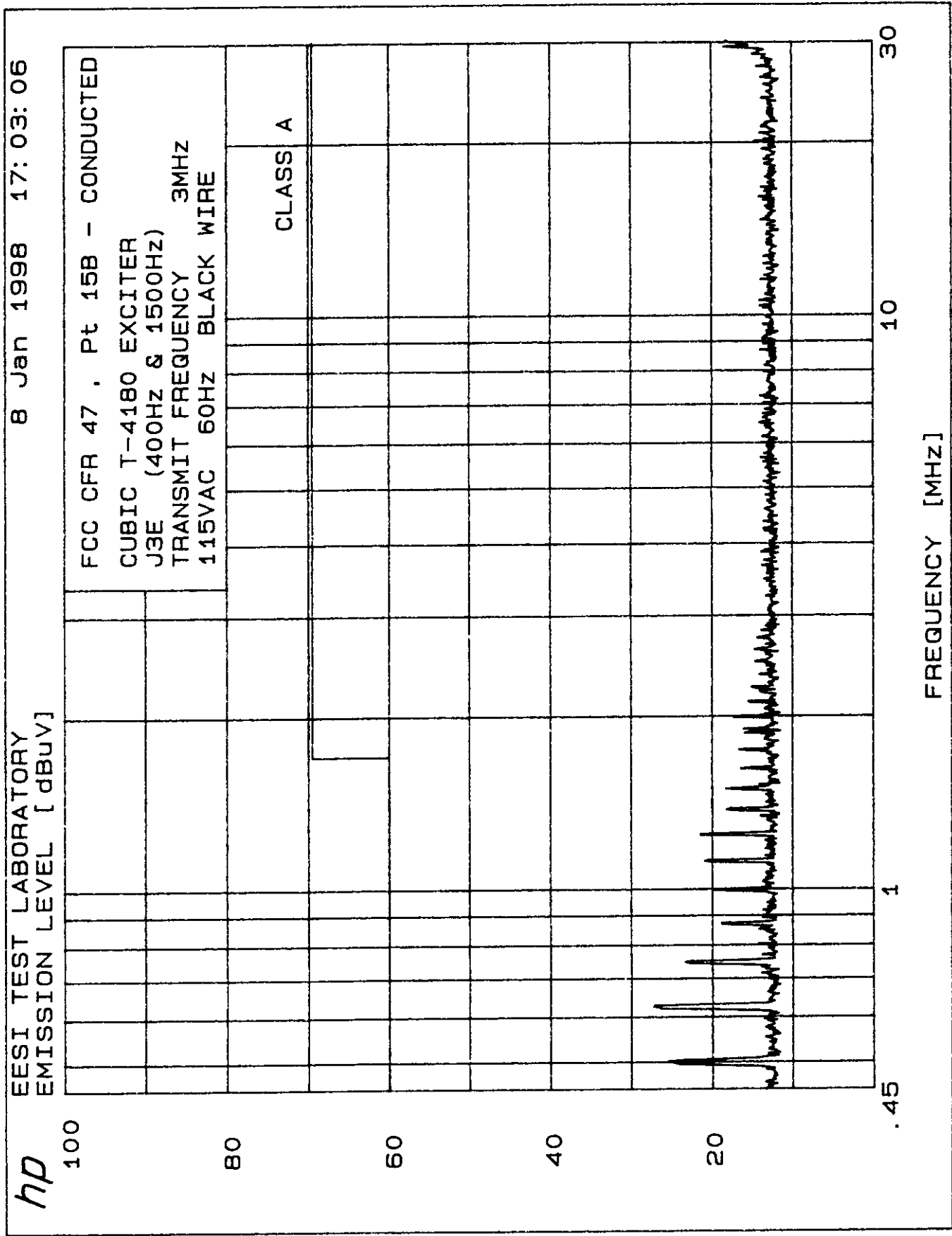
1. Ground plane (11 X 17 meters)
2. Spectrum Analyzer with Quasi-Peak Adapter
3. Coax interconnect from Receive Antenna to Spectrum Analyzer
4. Antenna Mast with motorized mounting assembly
5. Receive Antenna (* 3m distance from EUT on transmitter spurs and 10m distance for Class "A" Receive Mode emissions)
6. Non-Conducting table 80 cm above ground plane
7. EUT and associated system
8. AC power for devices (120/230 VAC, 50/60 cycles, single phase)

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Revision	Date	Document Name	Document #	FCC ID#	Page #
A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	15

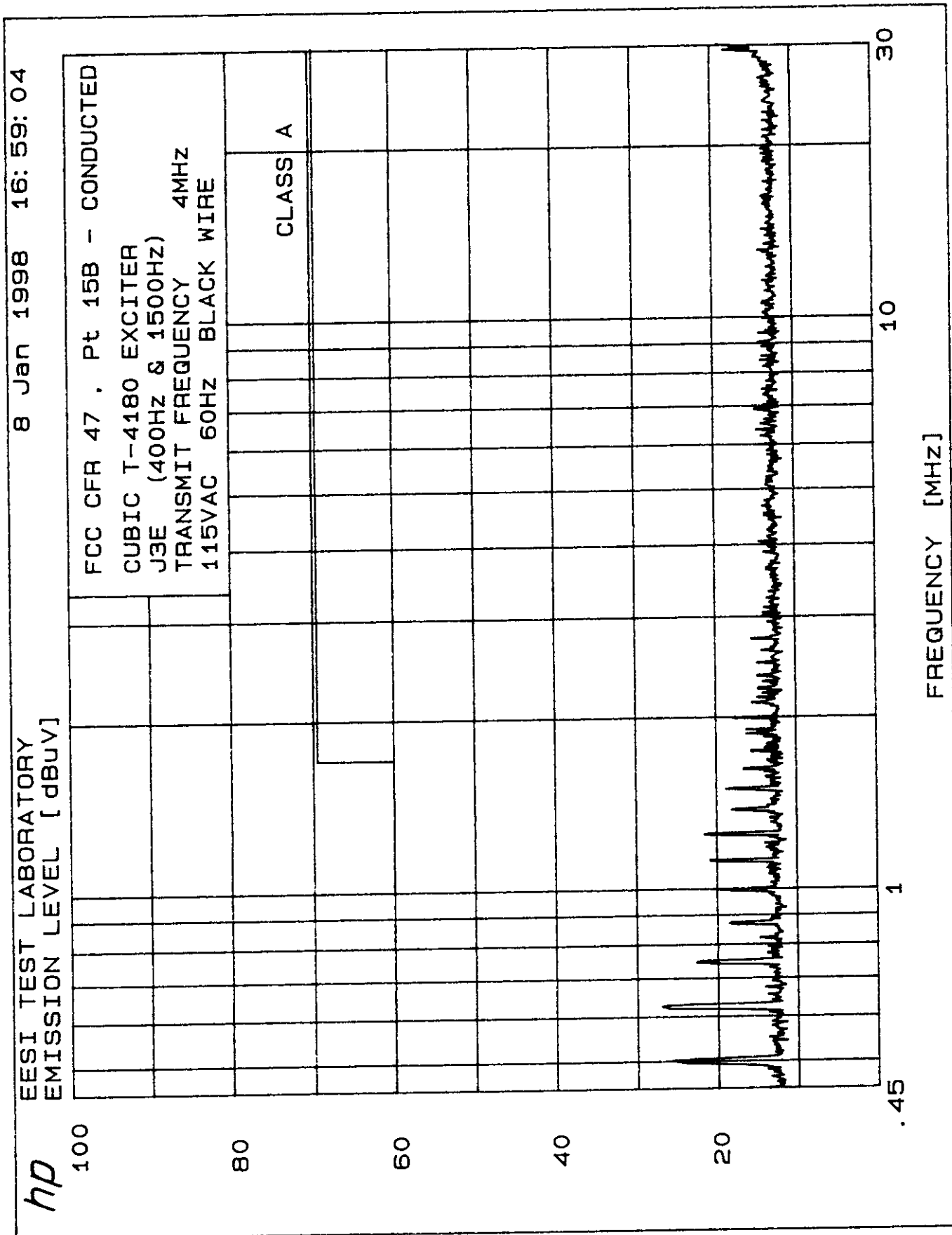
8. TEST RESULTS DATA

8.1 Conducted Emissions Test Results

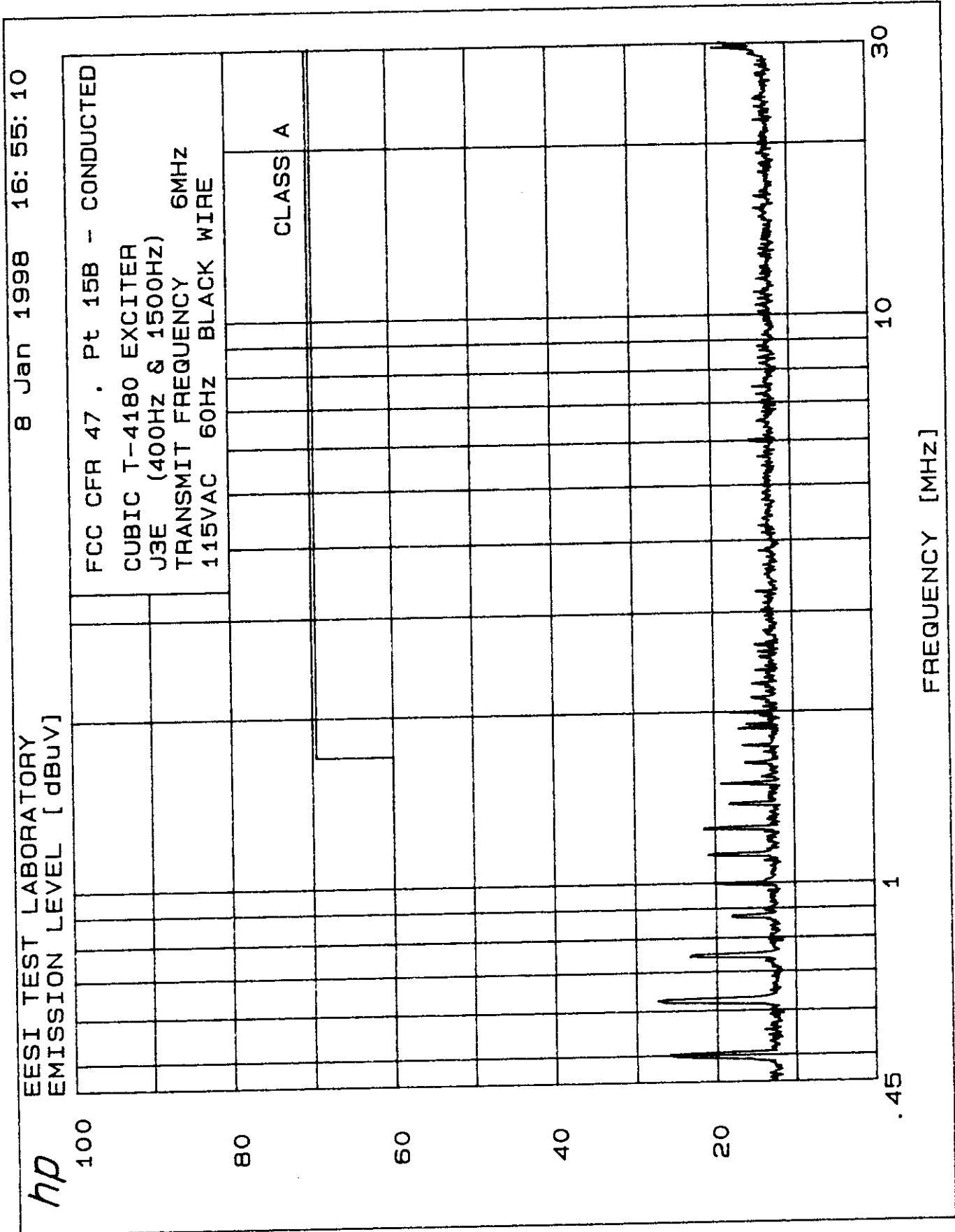




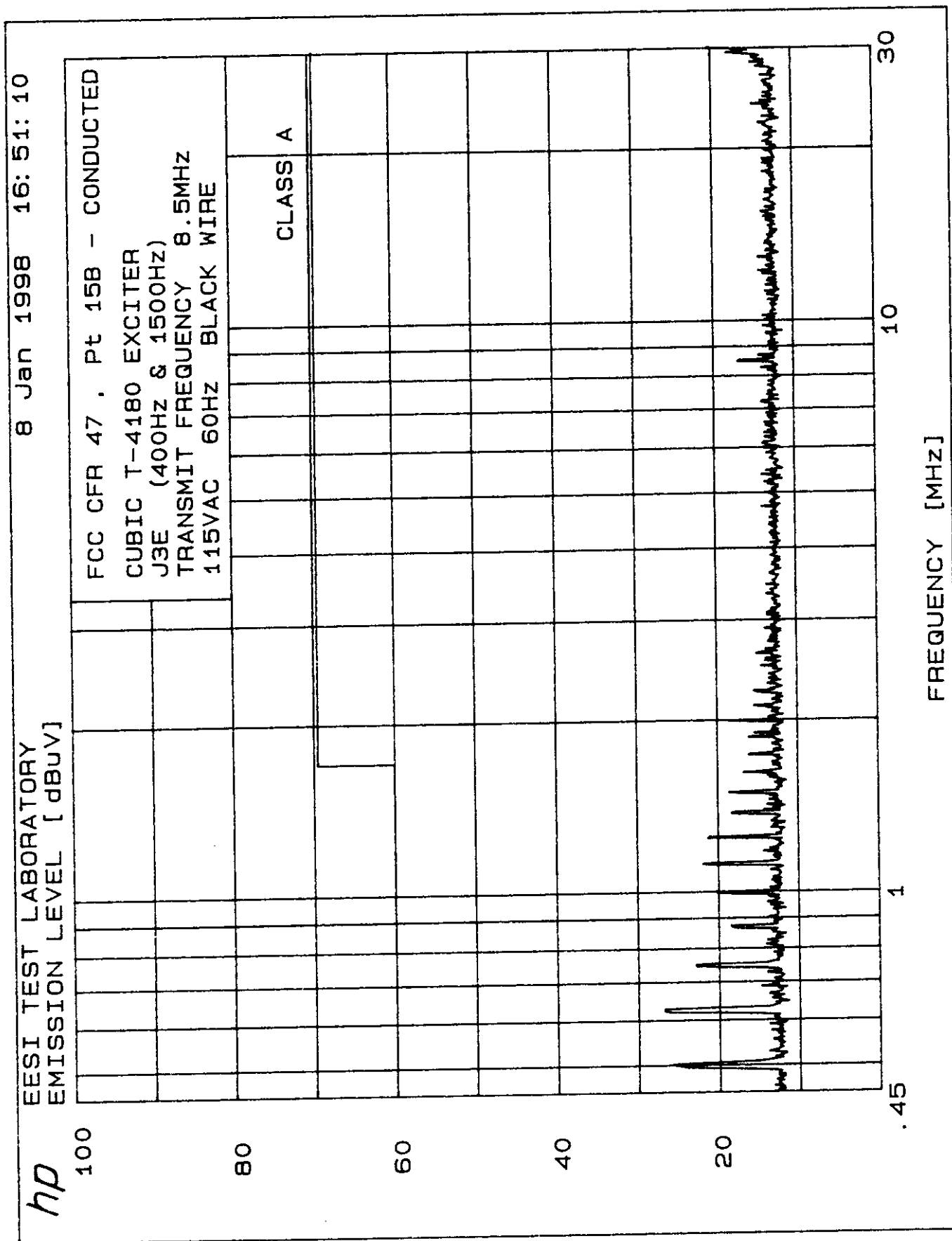
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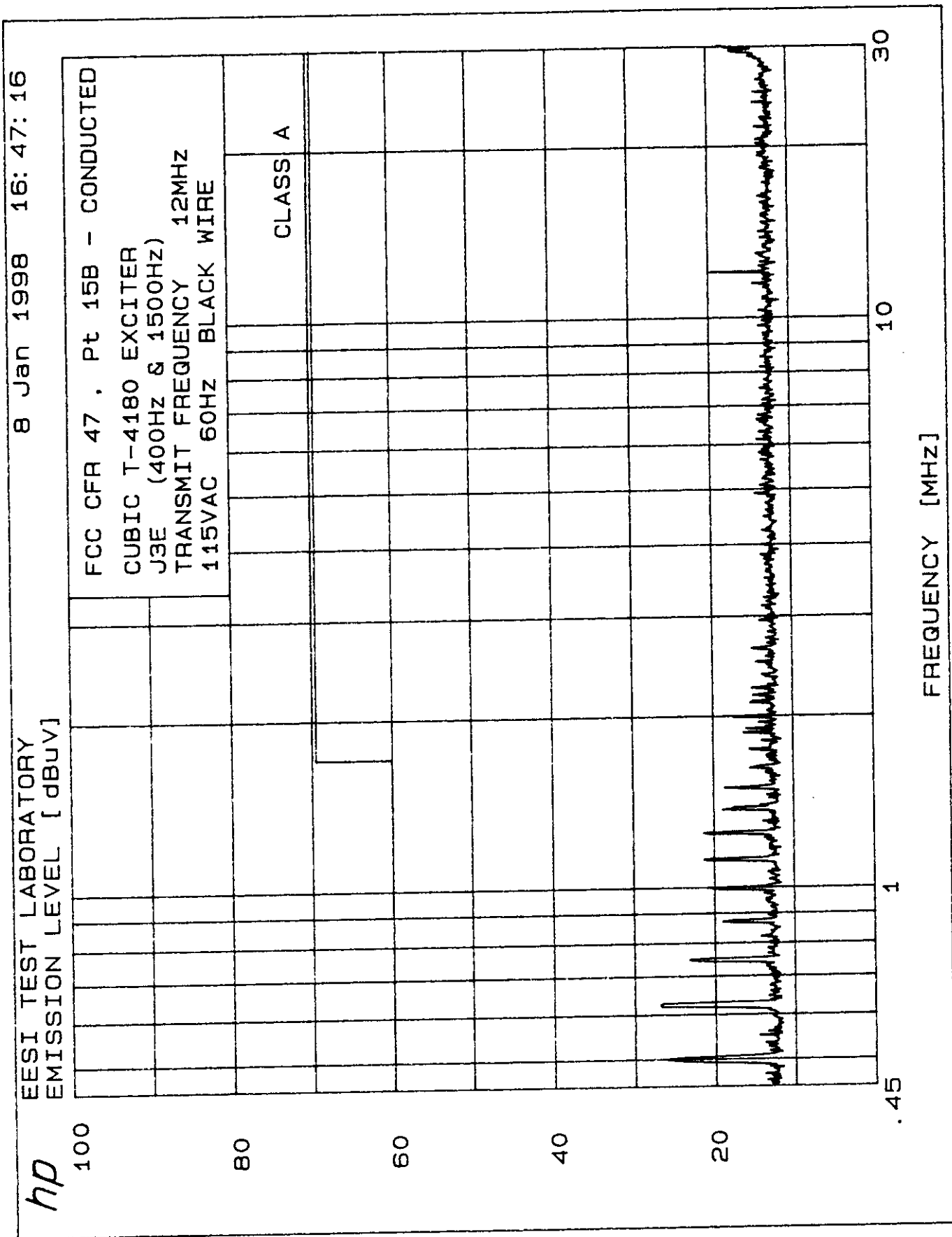
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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	19

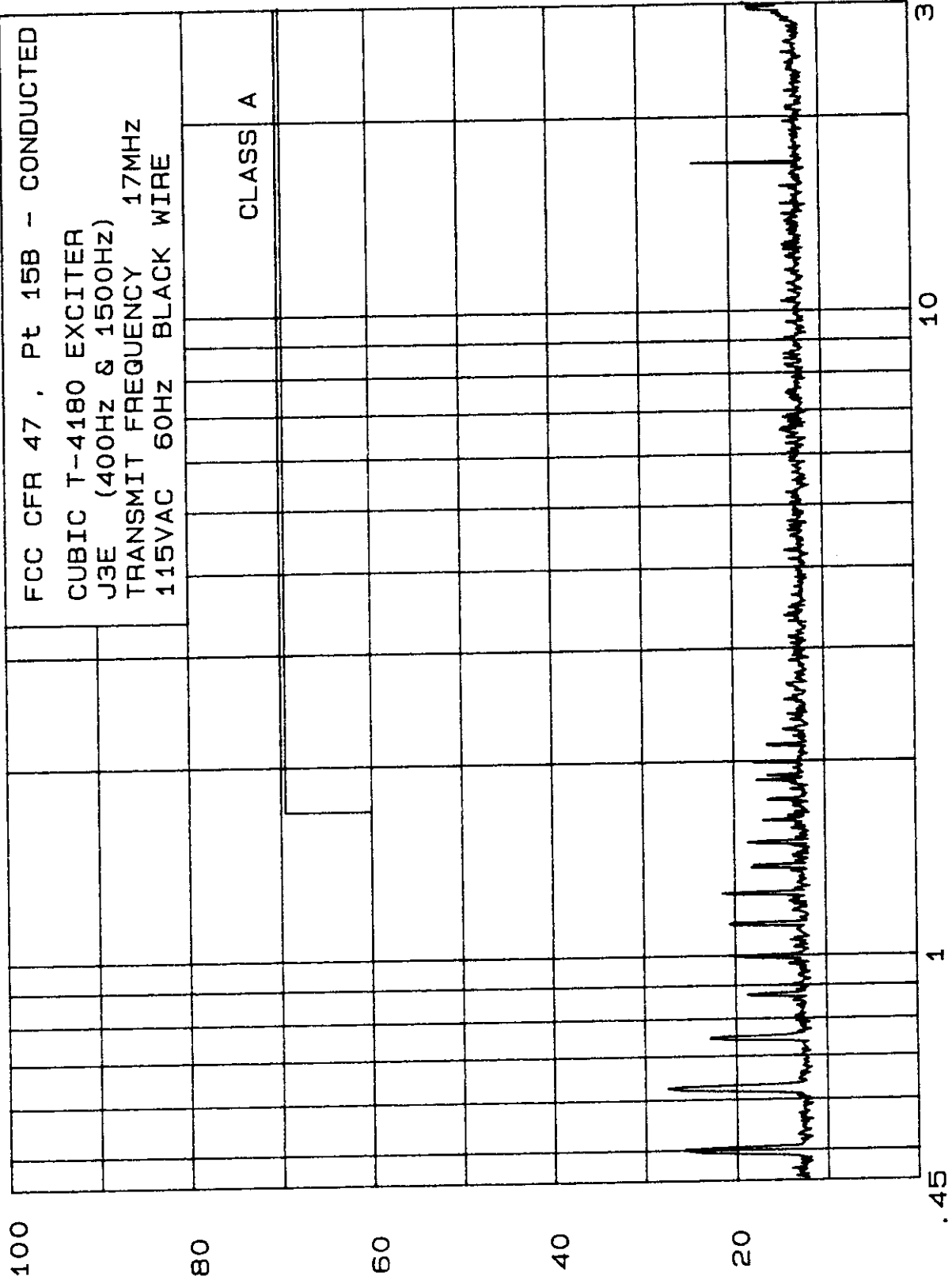


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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	20



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hp EESI TEST LABORATORY
EMISSION LEVEL [dBuV] 8 Jan 1998 16:43:23

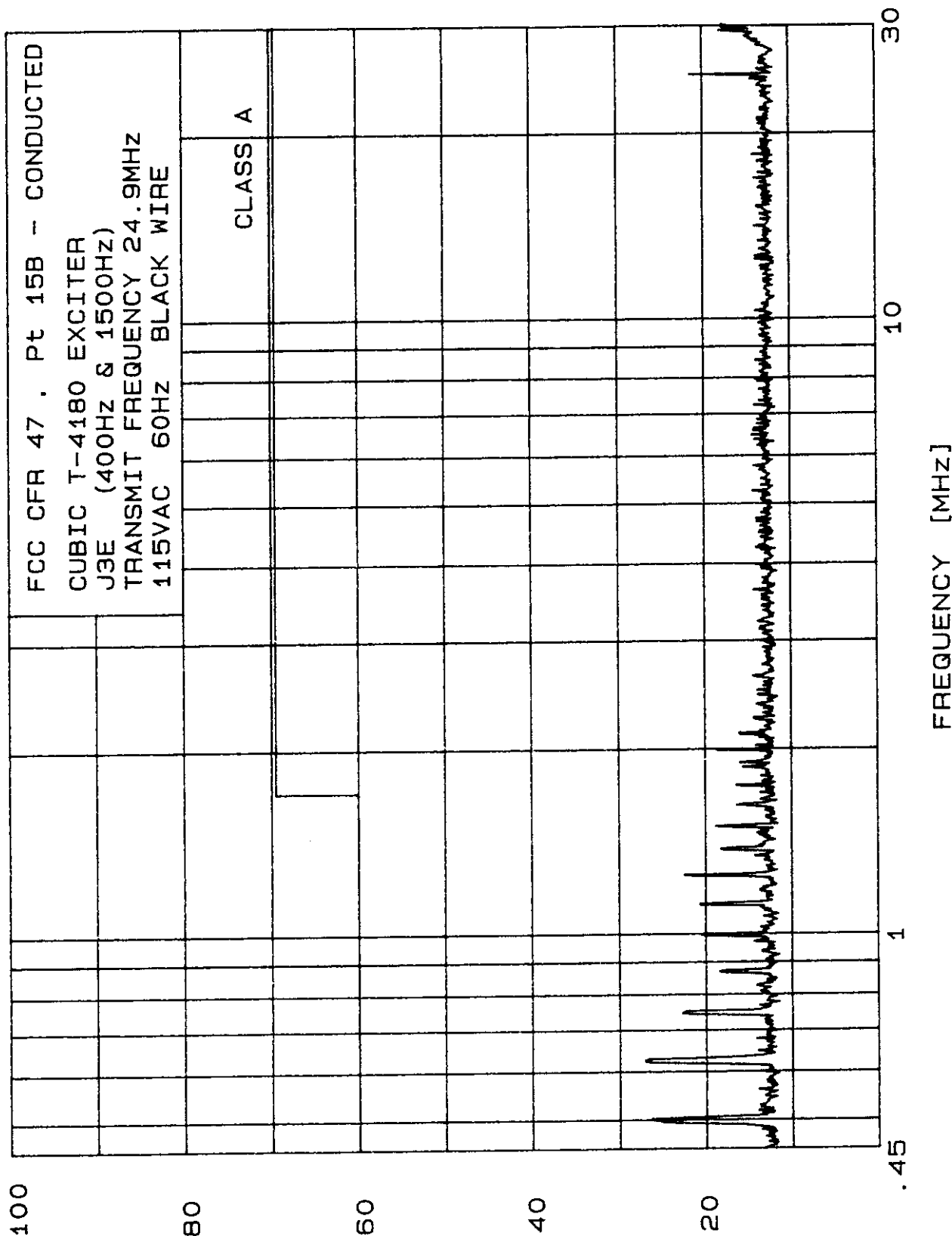


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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	22

8 Jan 1998 16:39:34

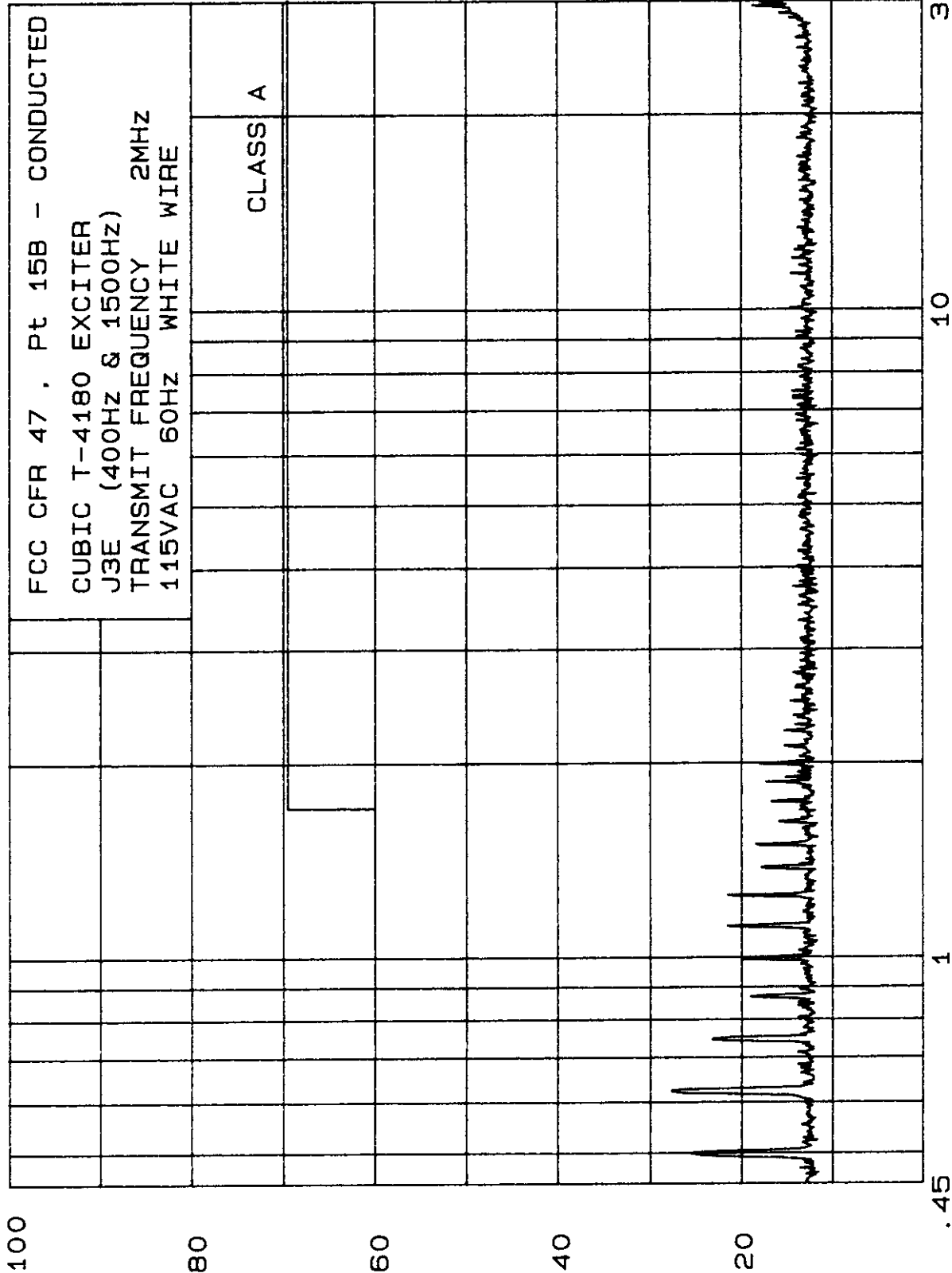
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hp

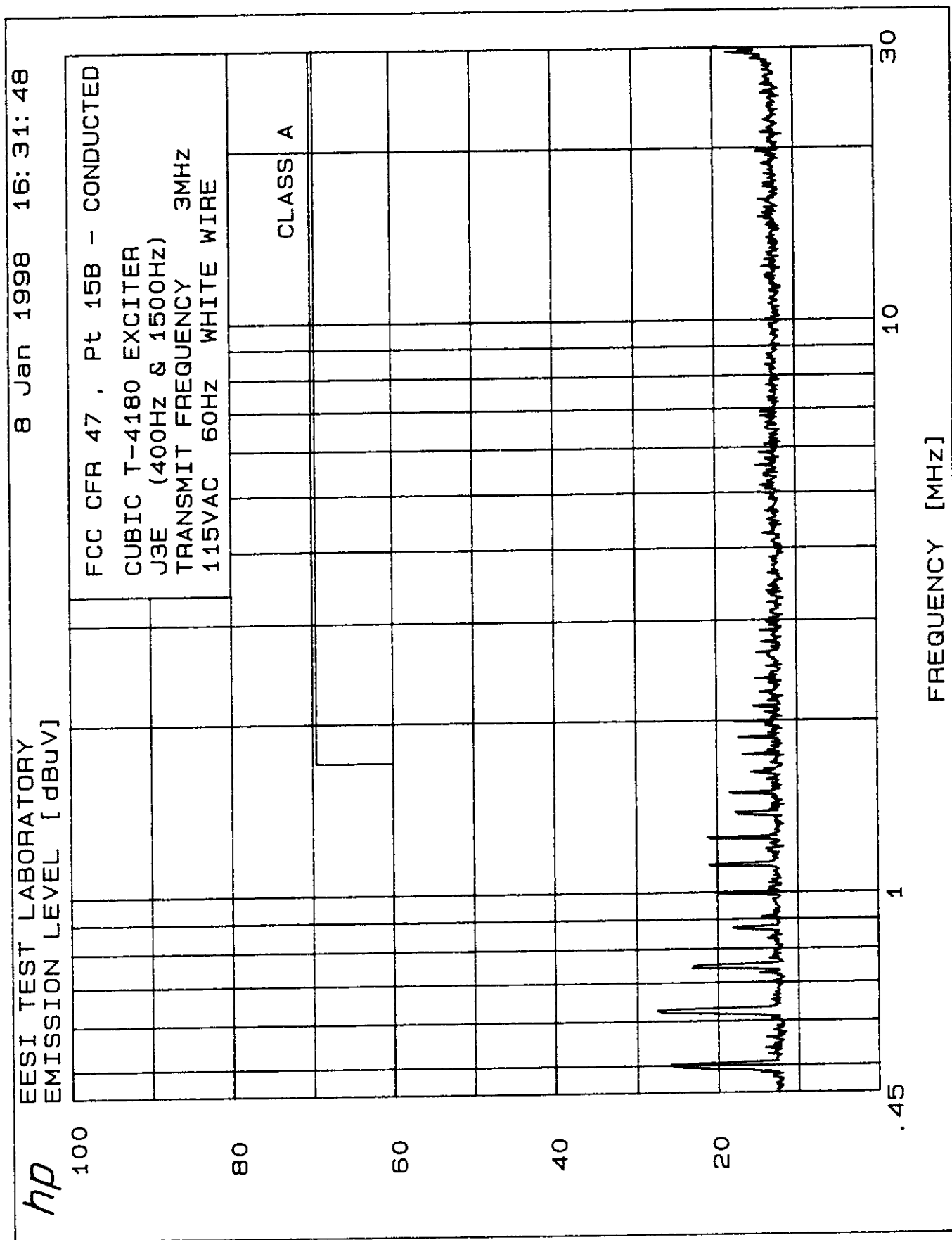


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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	23

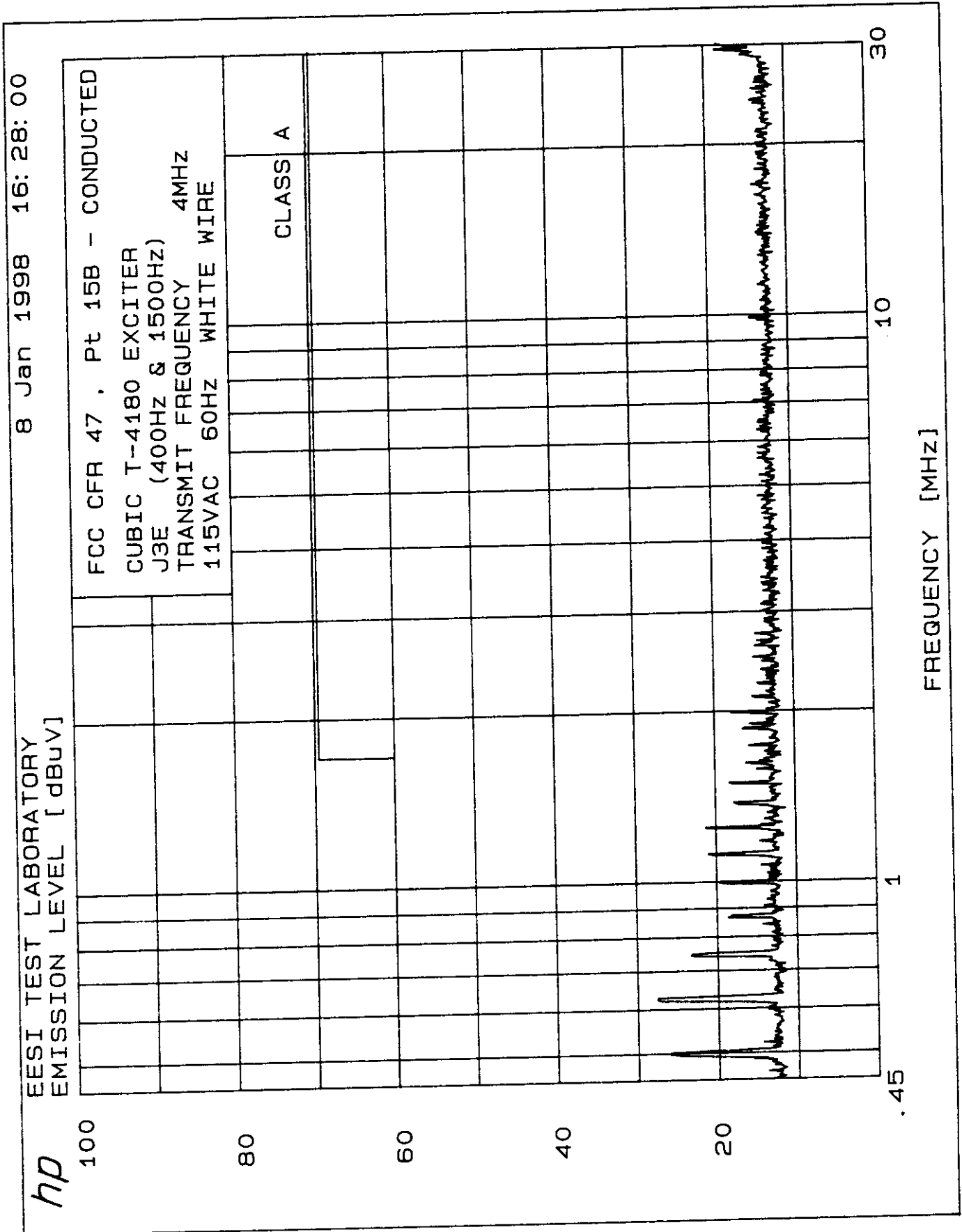
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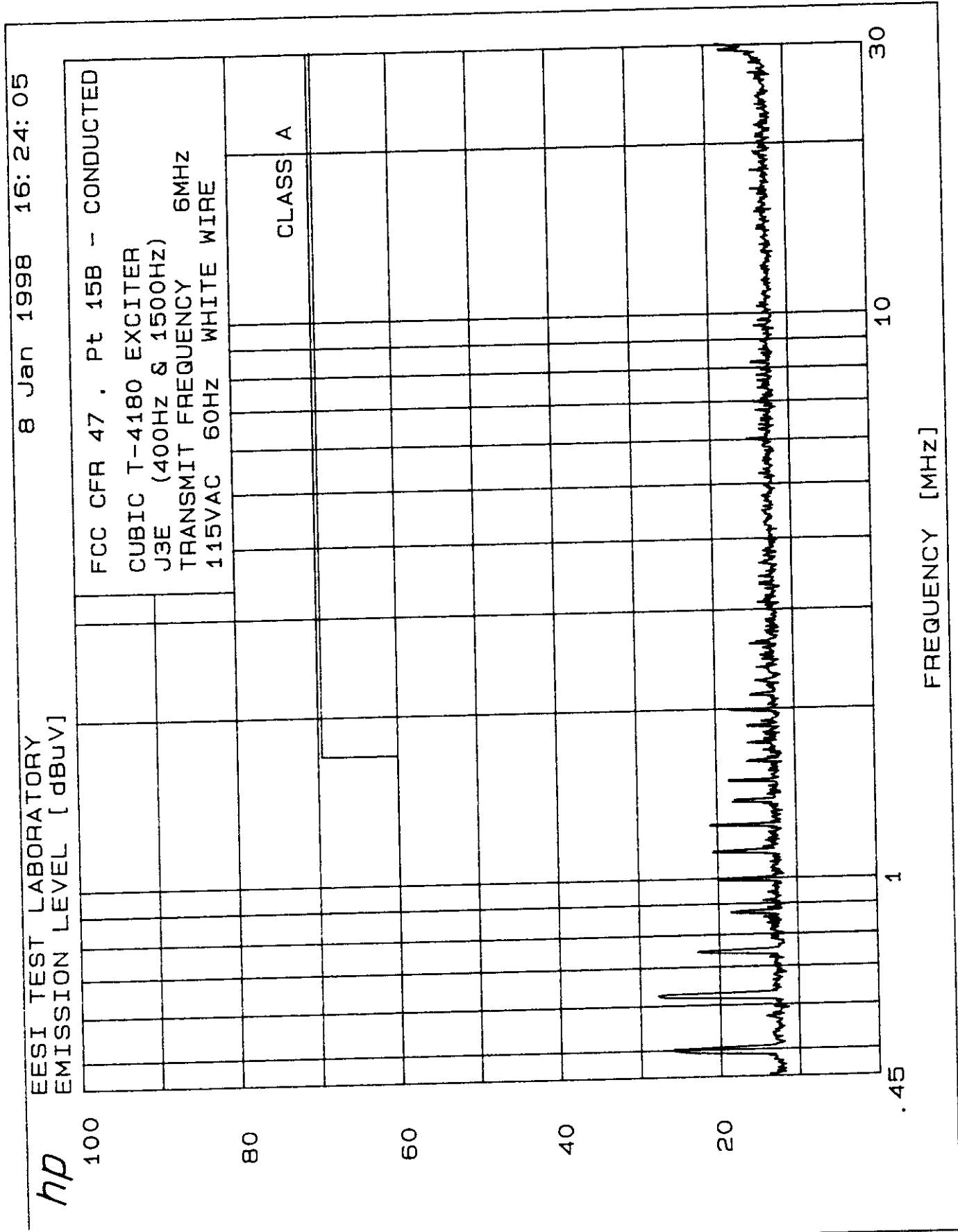


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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	24

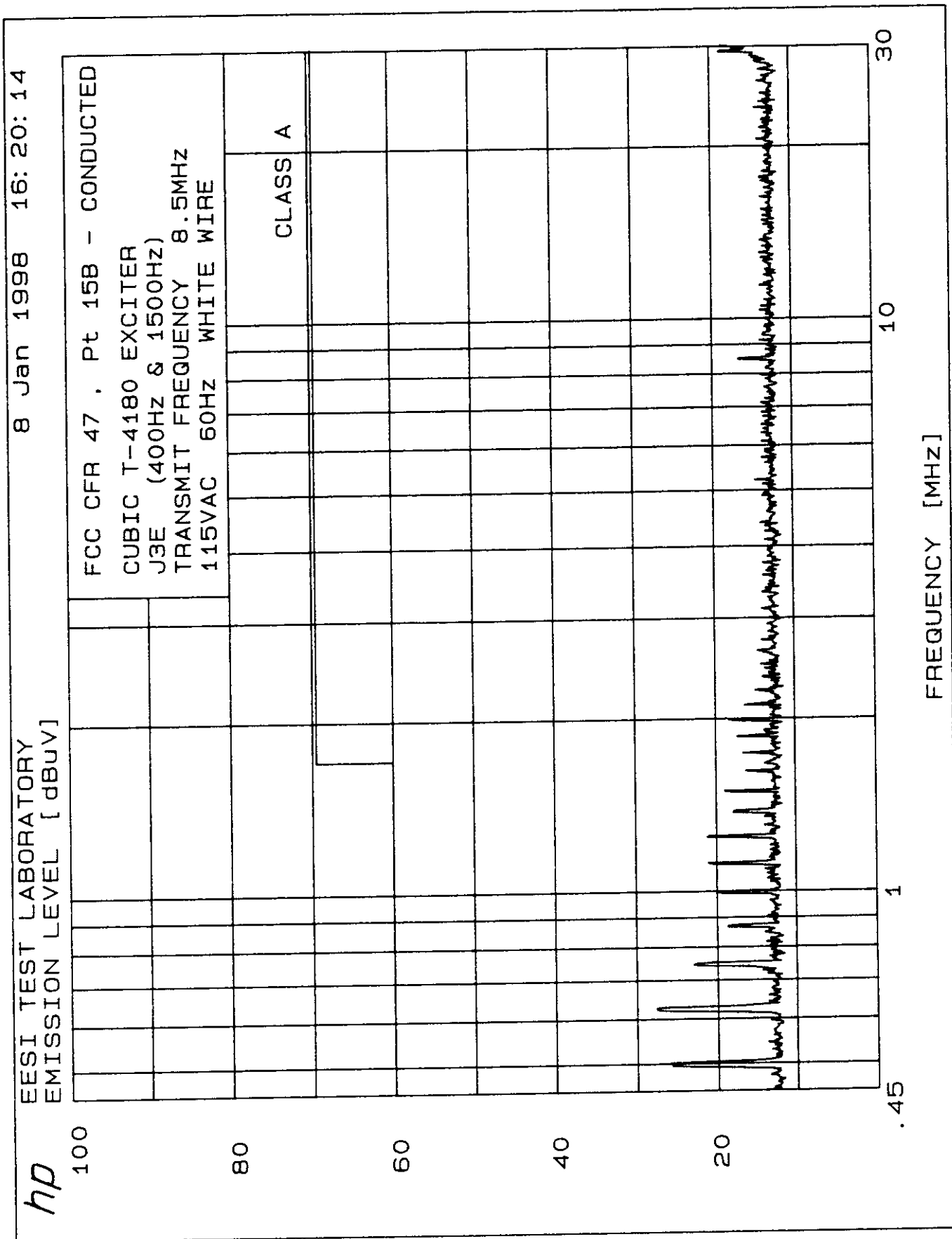


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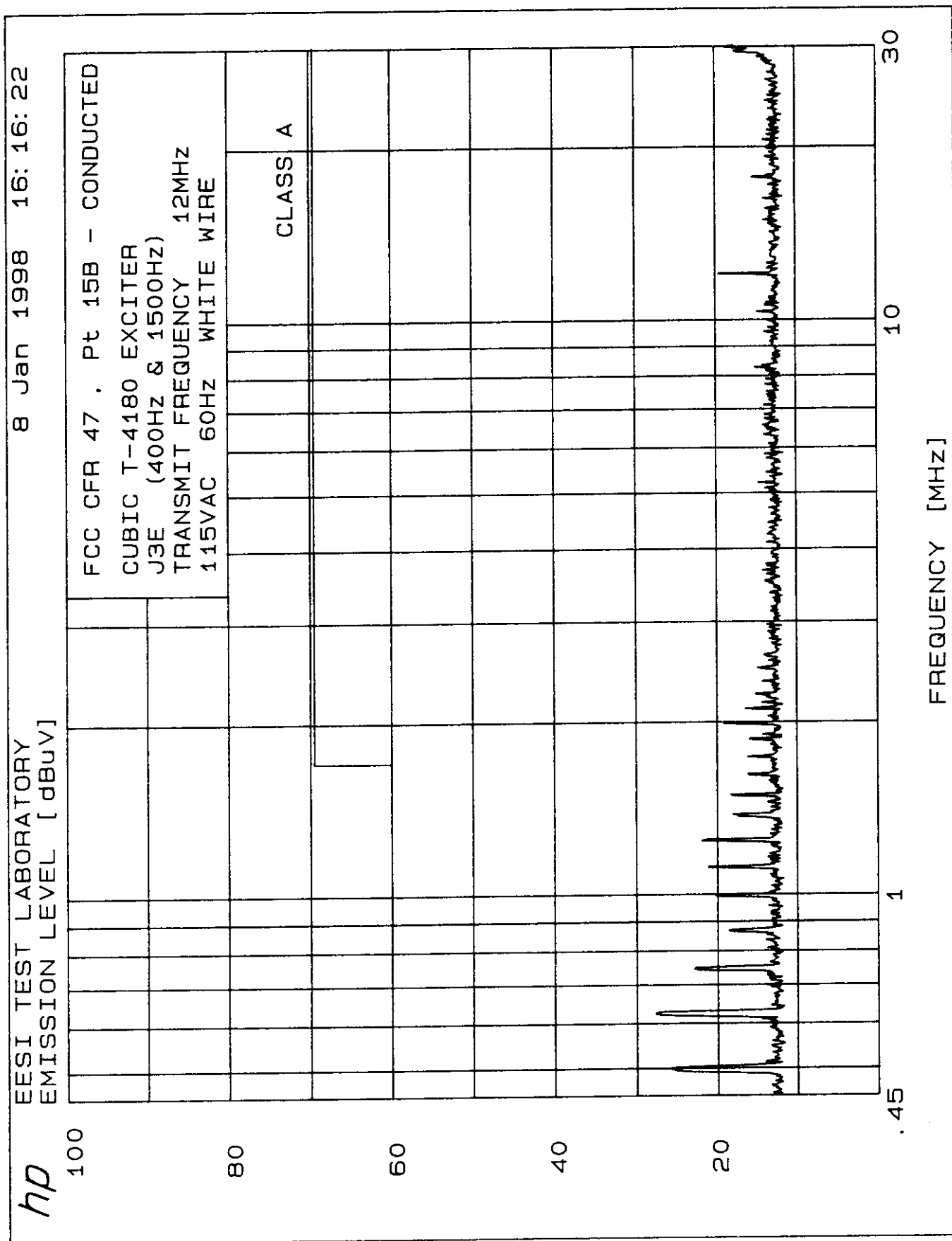




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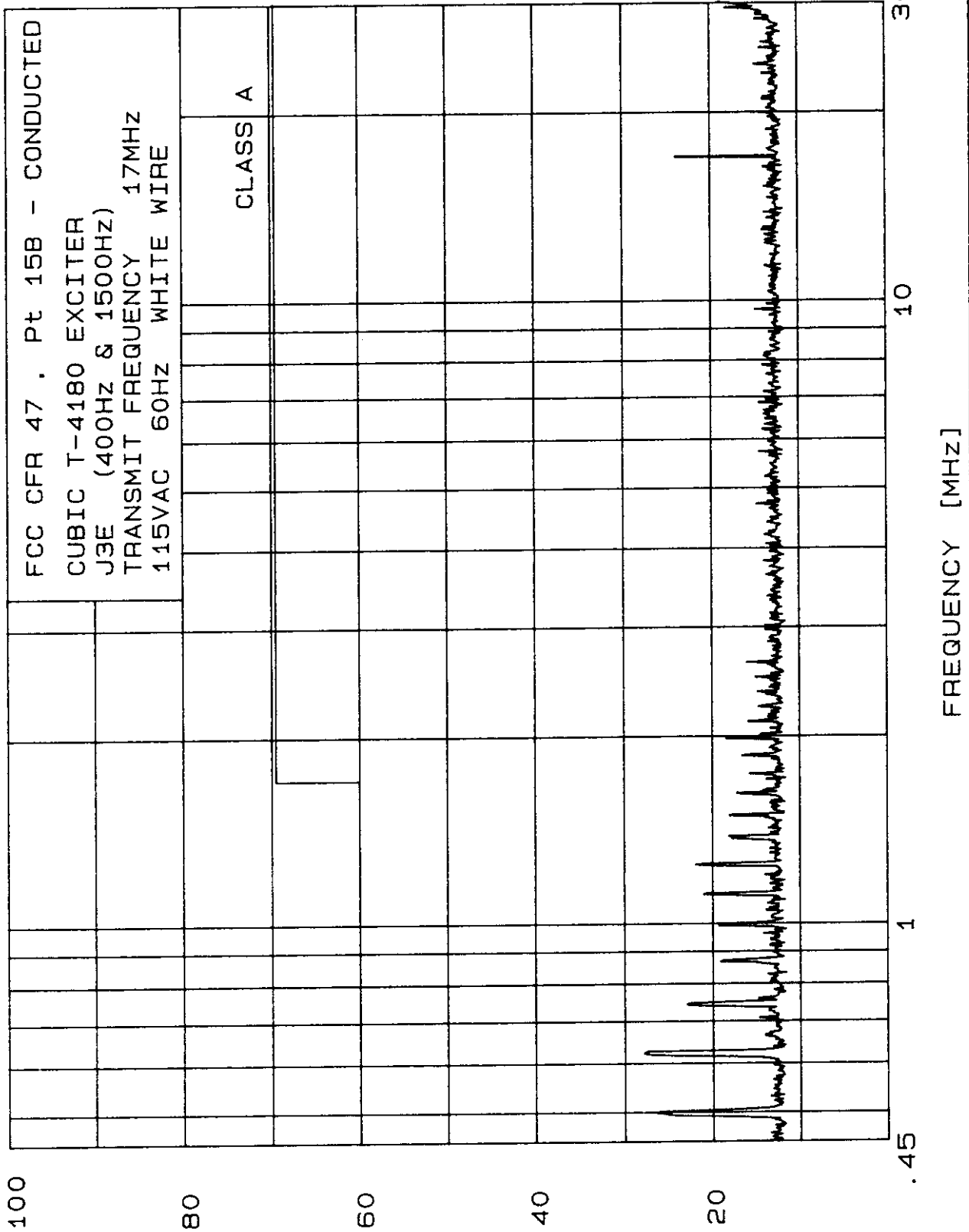


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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	29

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8 Jan 1998 16:10:32

hp



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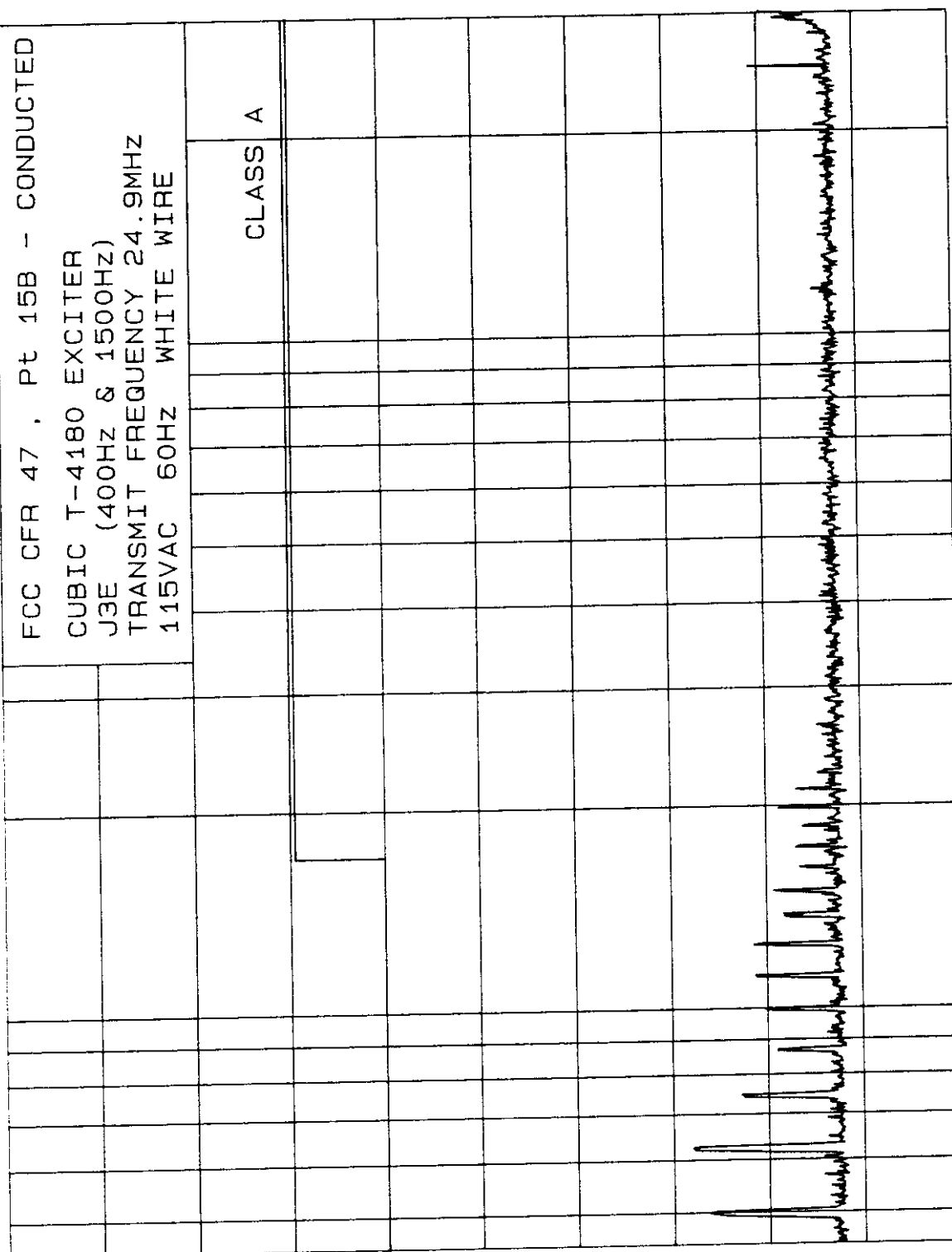
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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCCTX-1000	30

8 Jan 1998 16:02:53

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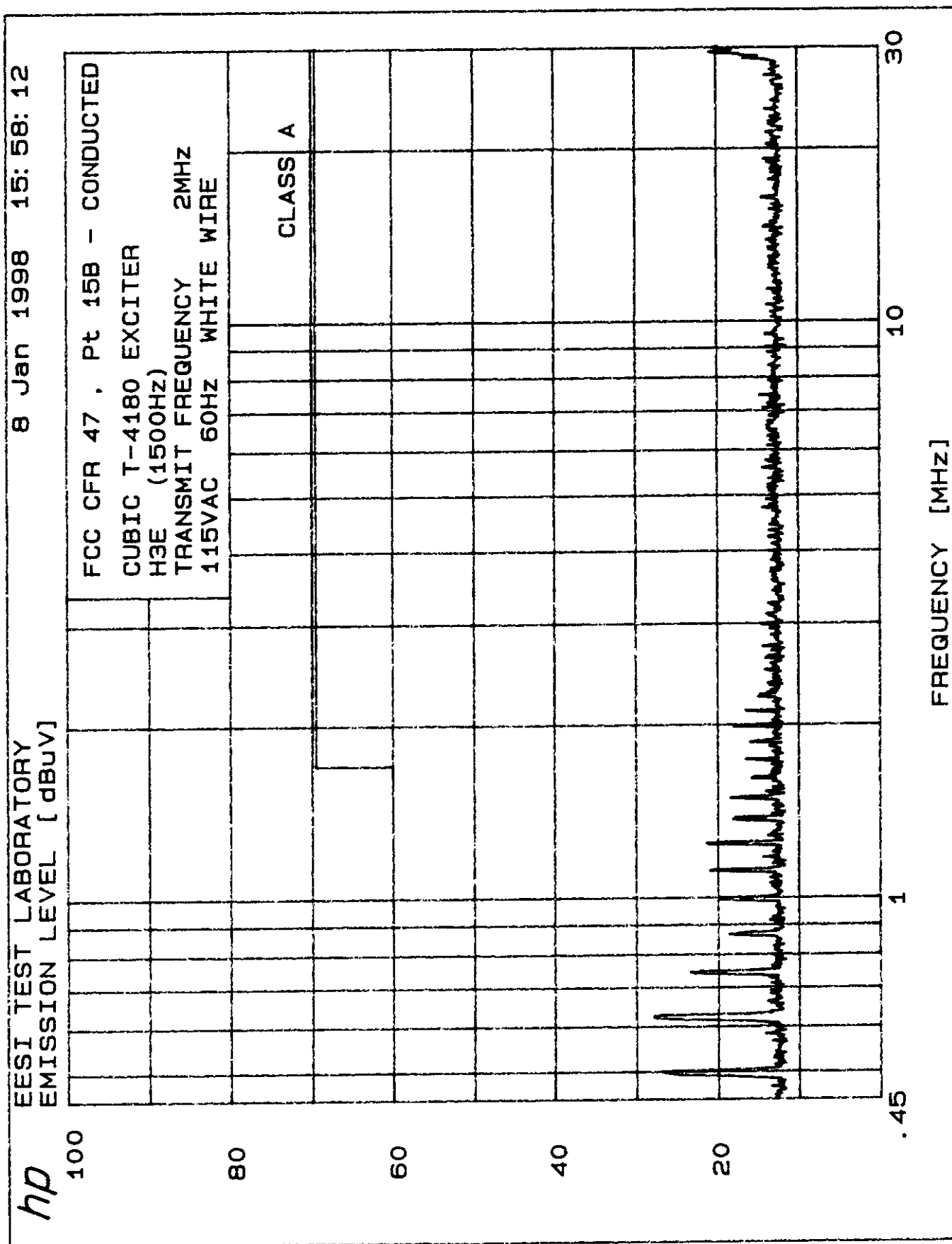
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CUBIC T-4180 EXCITER
J3E (400Hz & 1500Hz)
TRANSMIT FREQUENCY 24.9MHz
115VAC 60Hz WHITE WIRE

CLASS A



FREQUENCY [MHz]

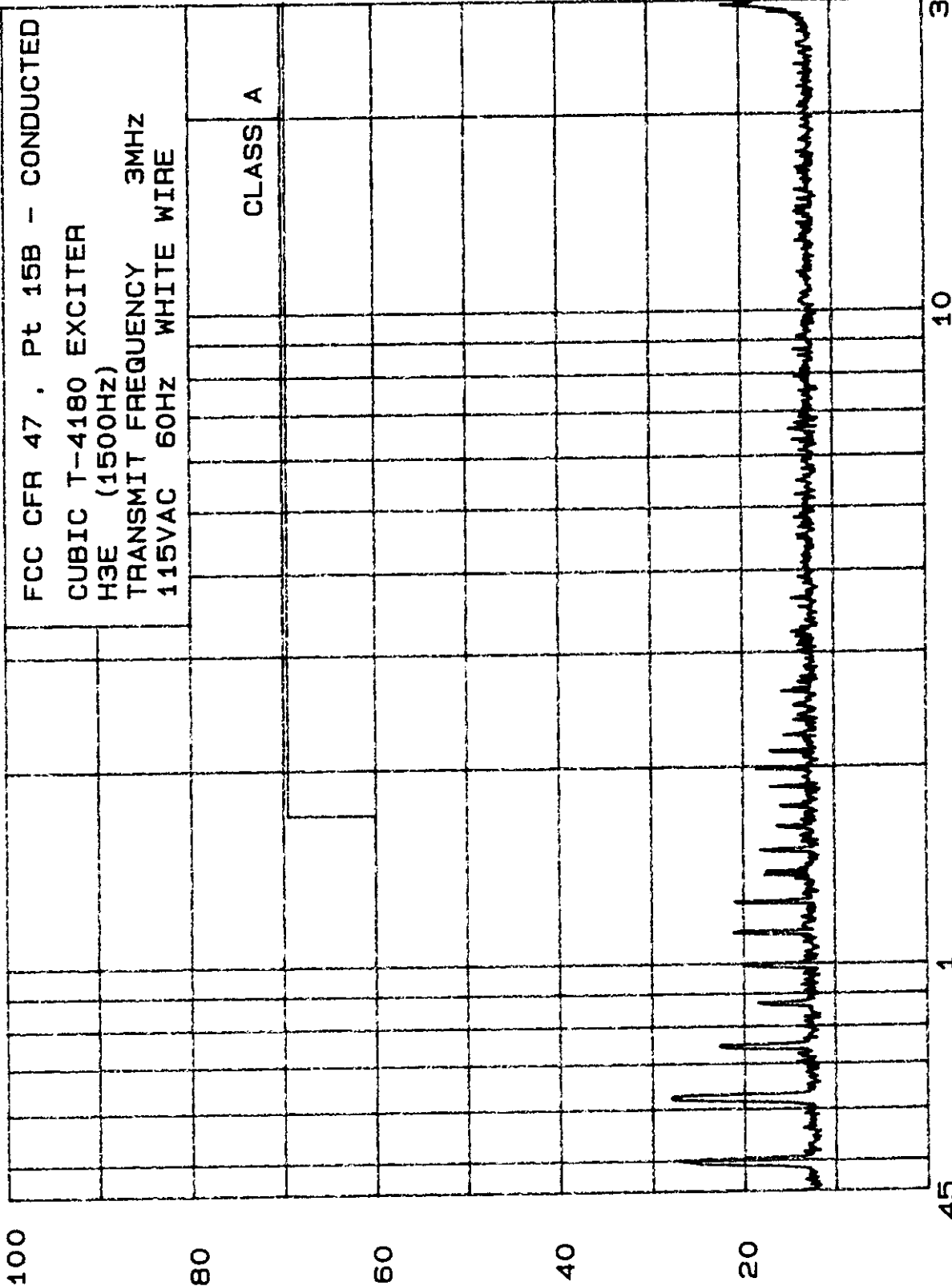
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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	31



Revision	Date	Document Name	Document #	FCC ID#	Page #
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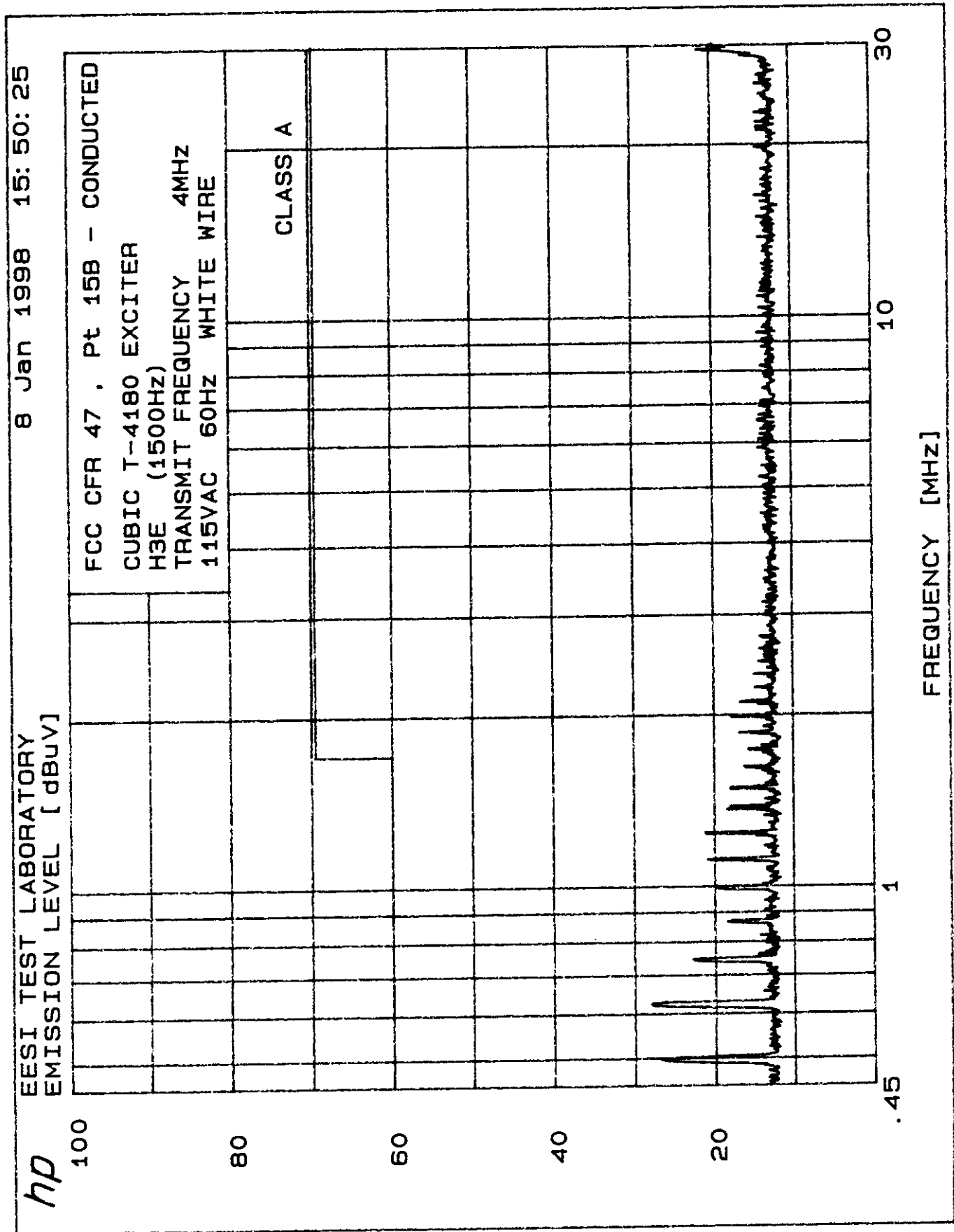
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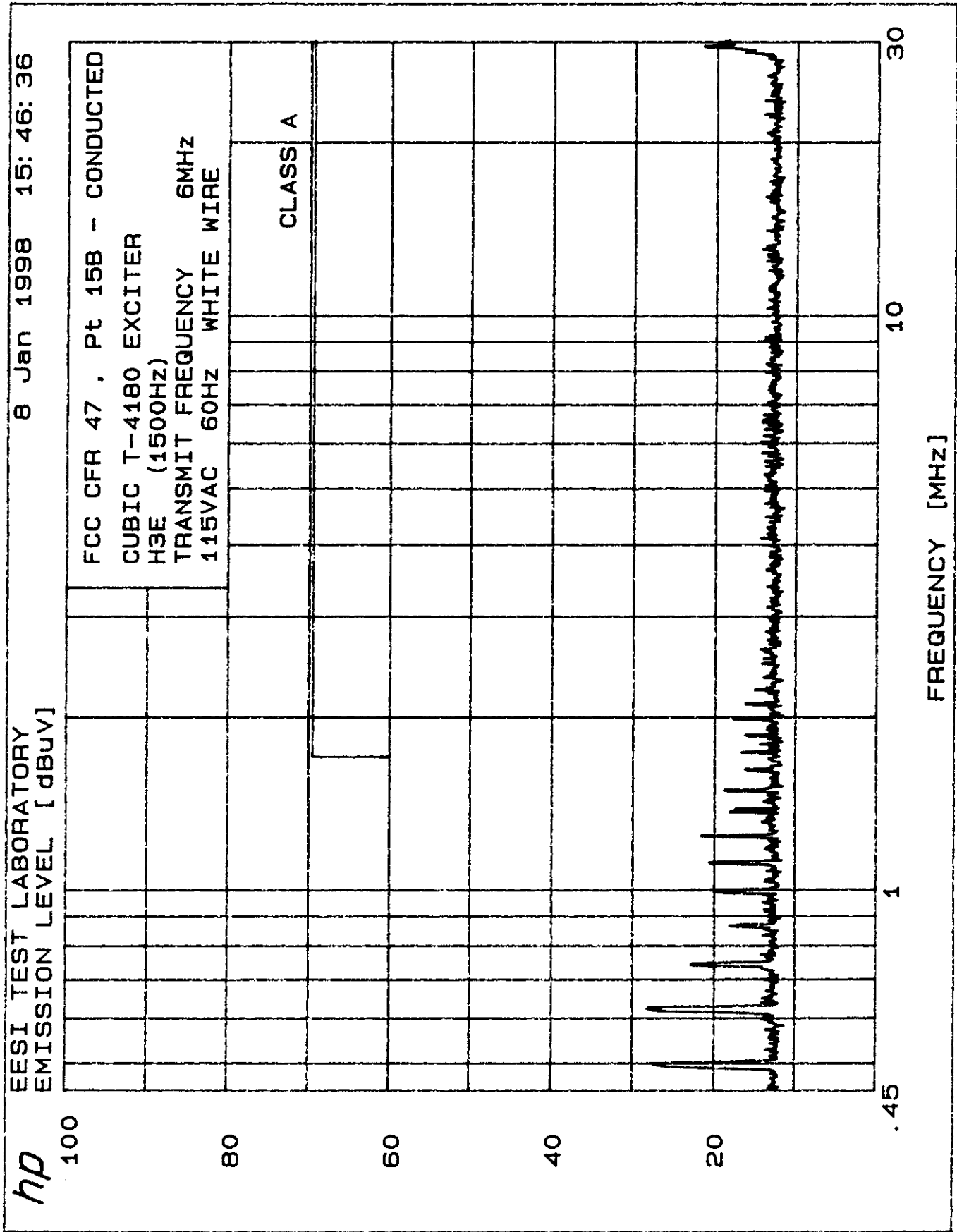
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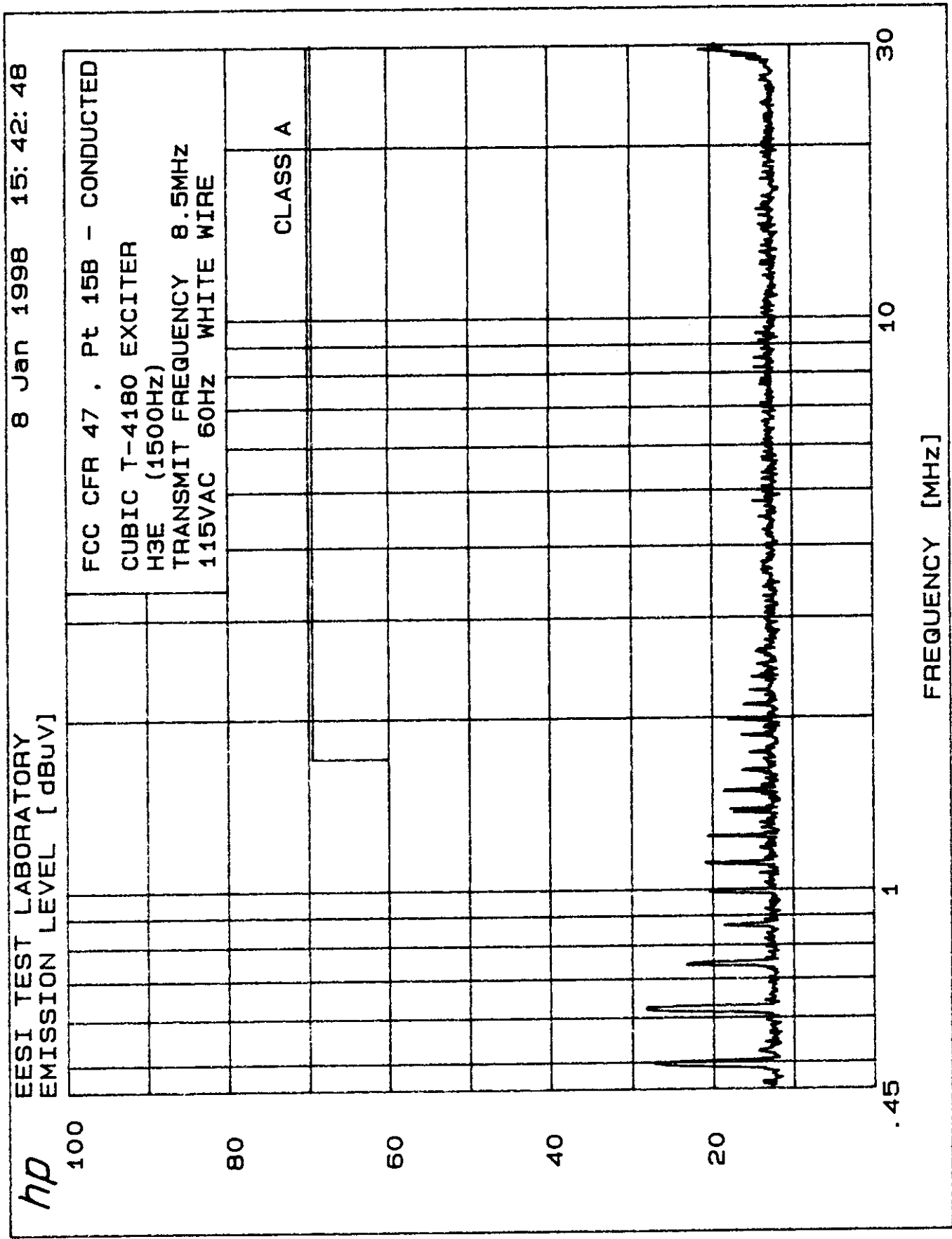


FREQUENCY [MHz]

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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	33

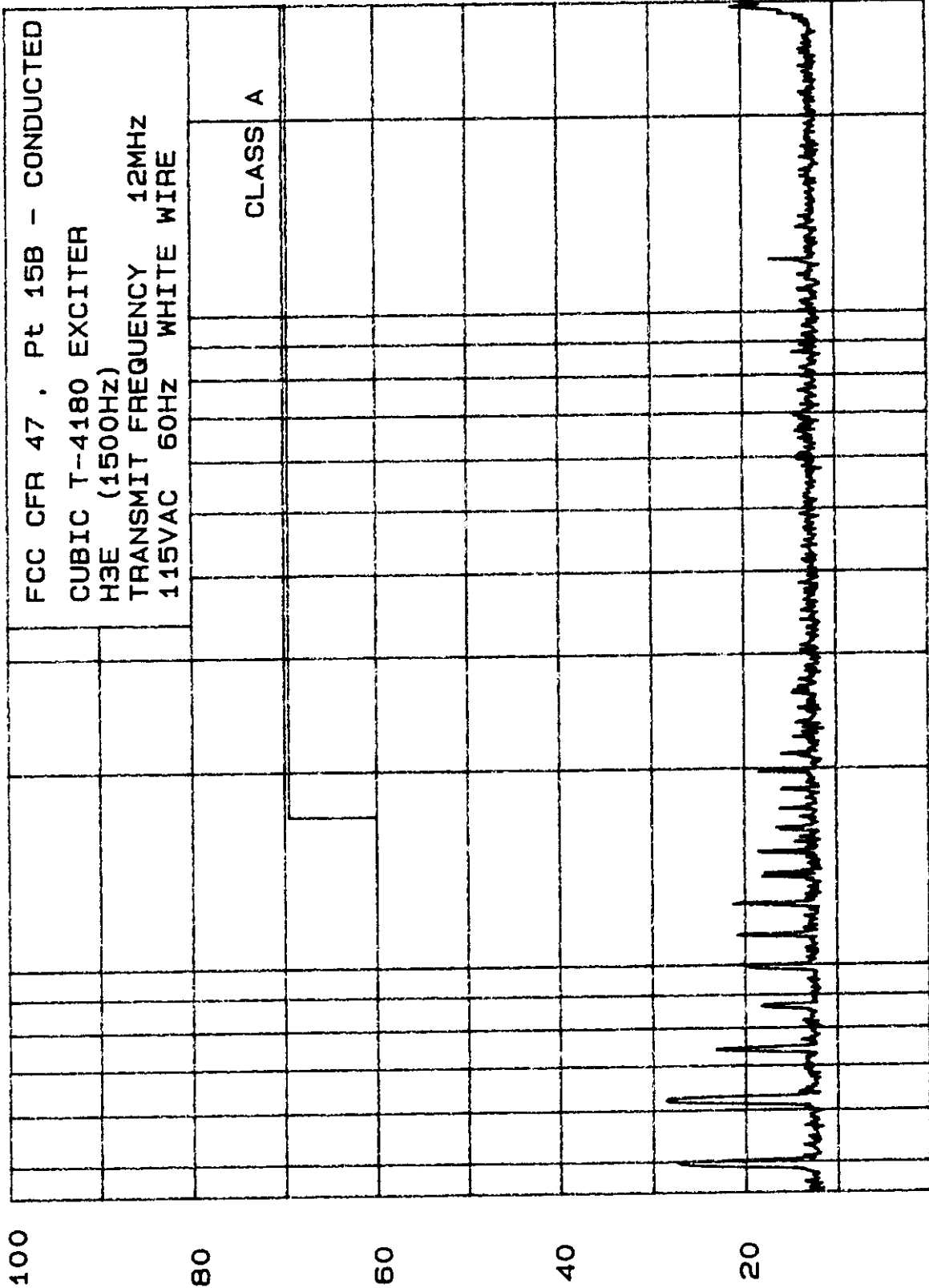






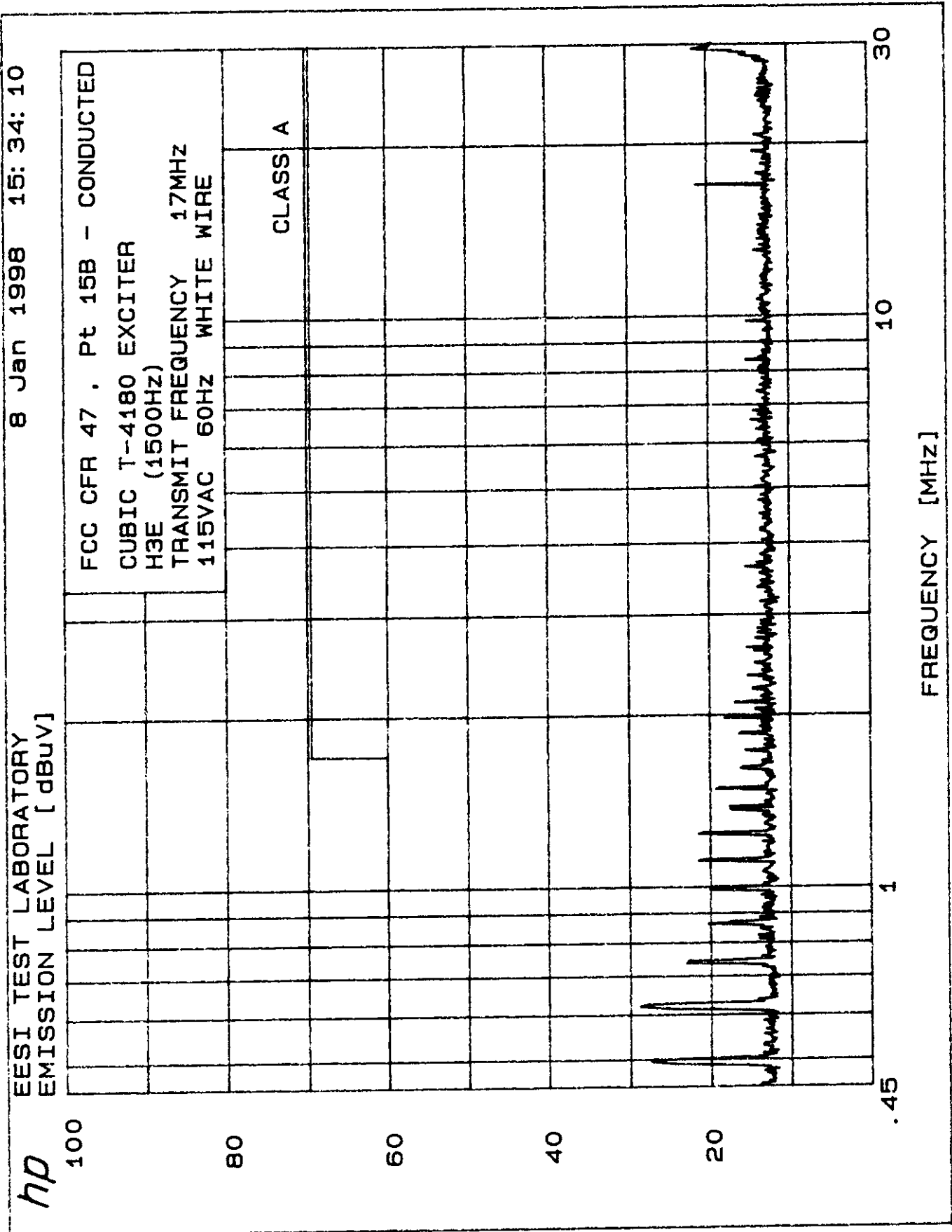
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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	36

hp EESI TEST LABORATORY
EMISSION LEVEL [dBuV] 8 Jan 1998 15:38:53

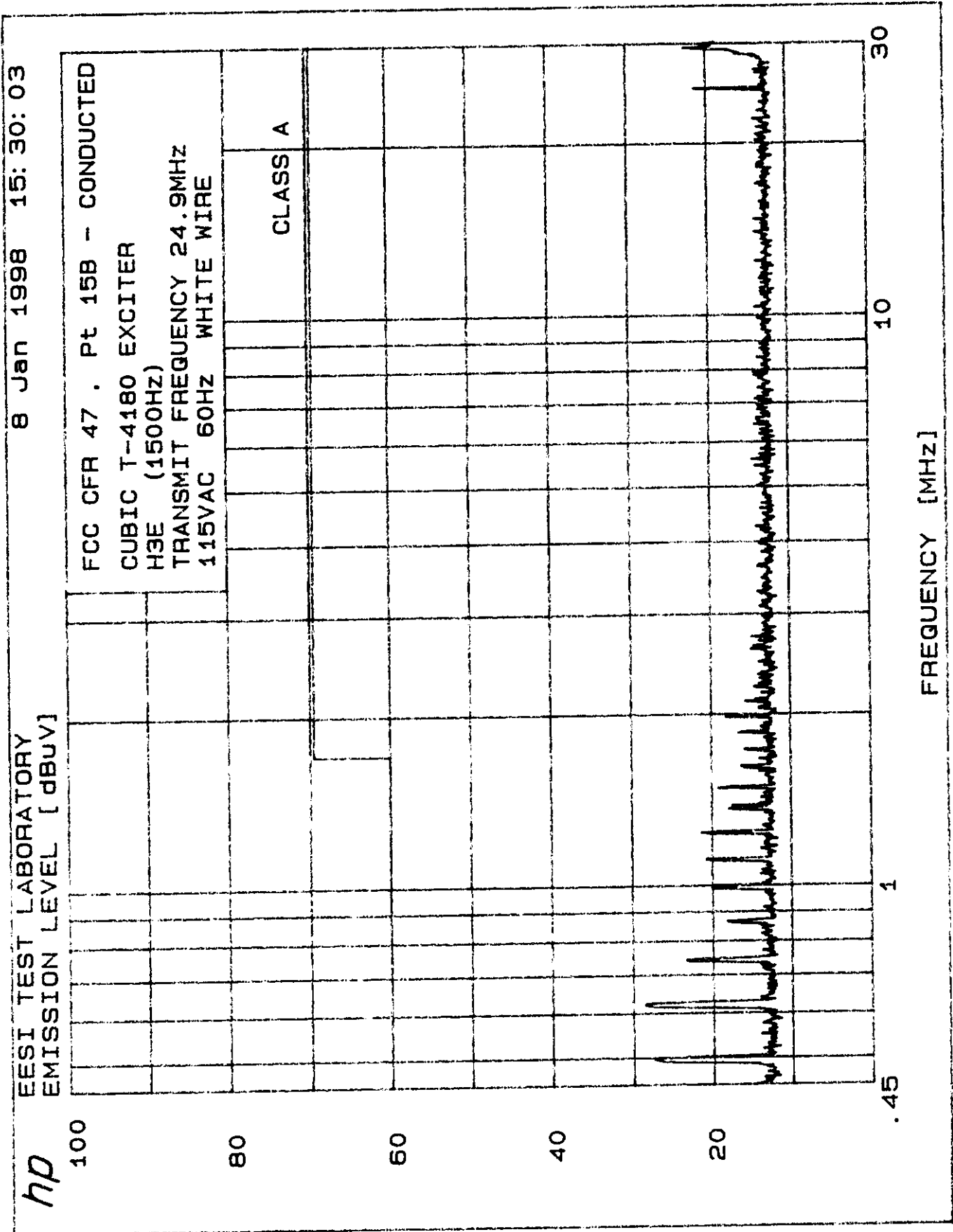


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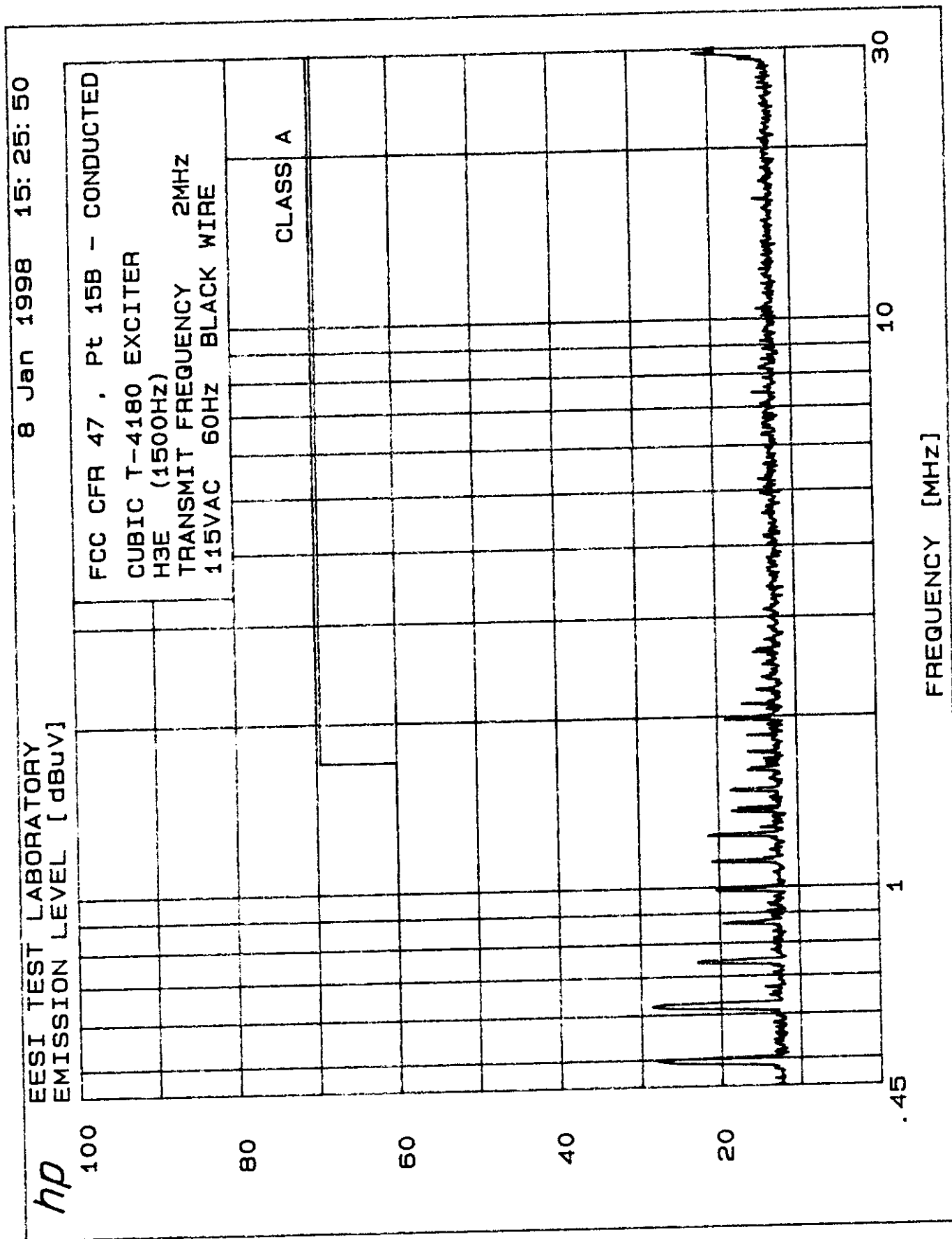
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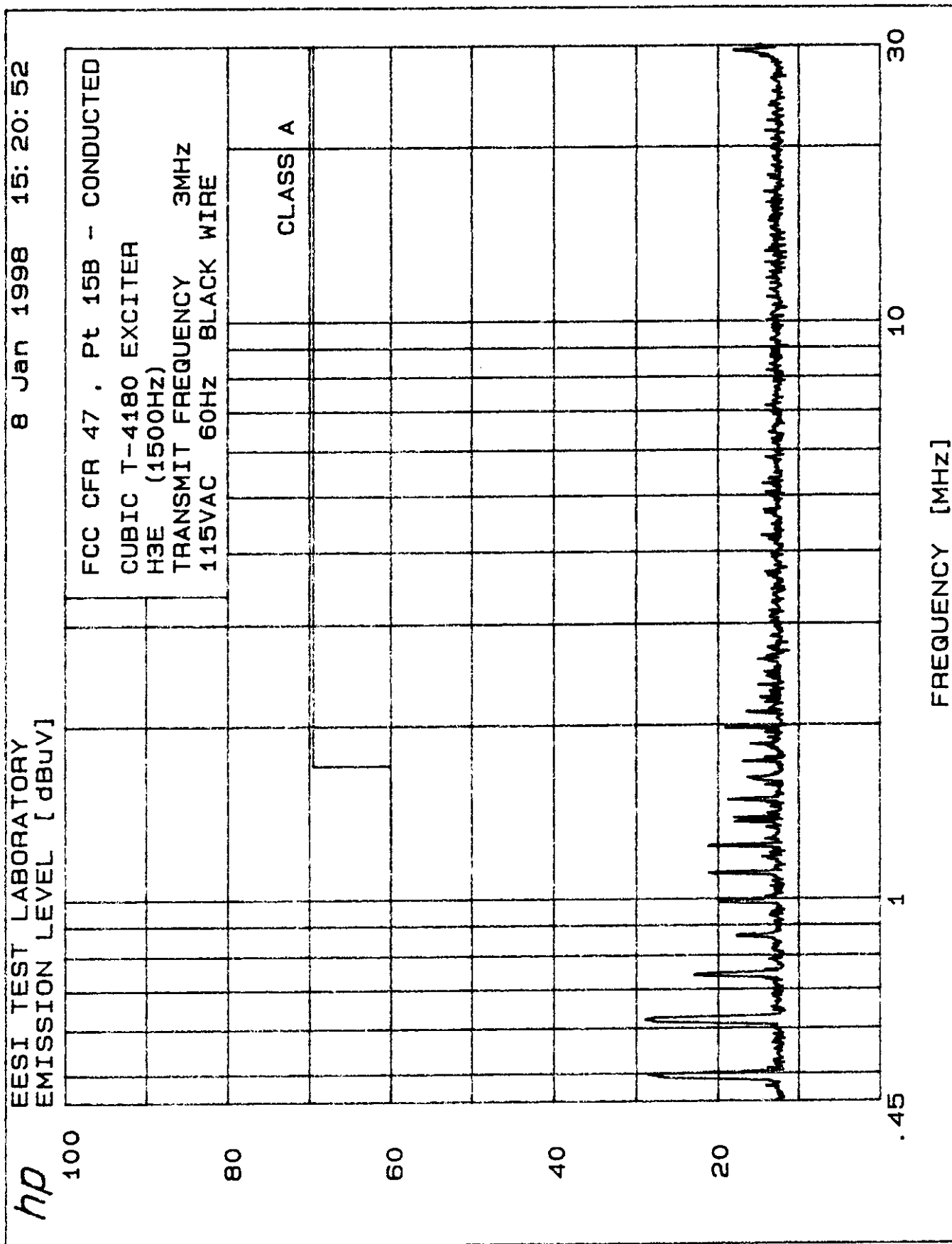
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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	38



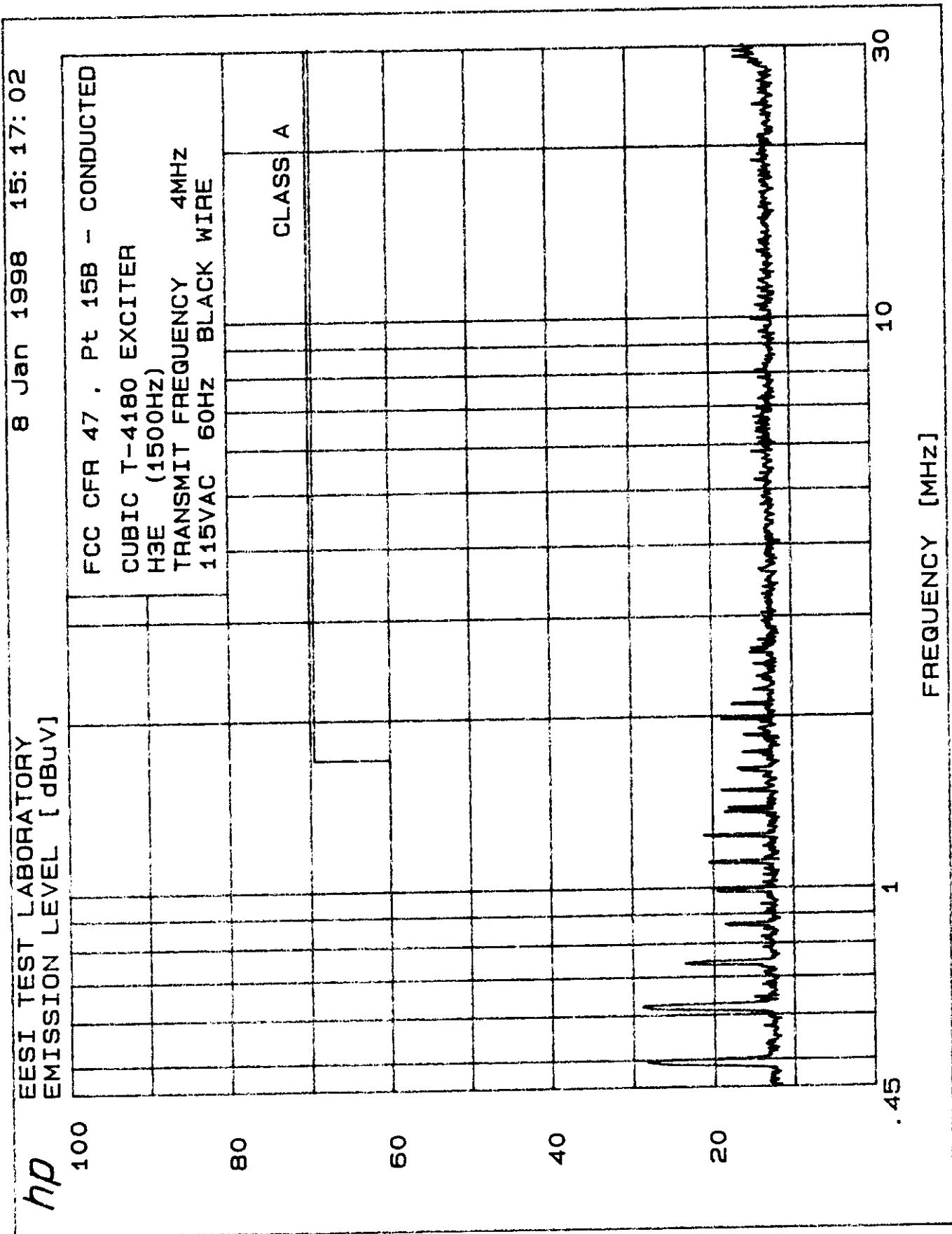
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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	39



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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	40

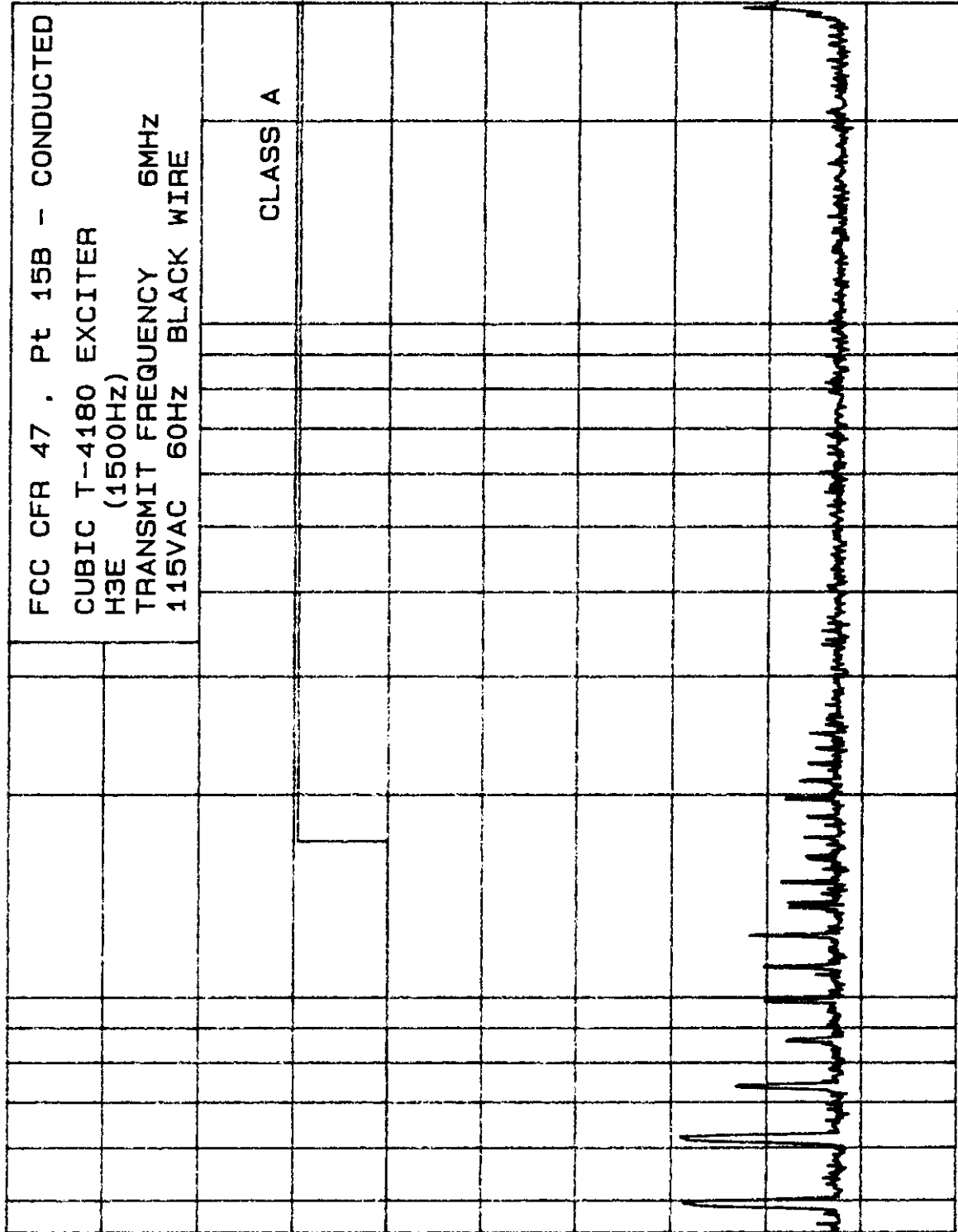


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hp
EESI TEST LABORATORY
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8 Jan 1998 15:11:58

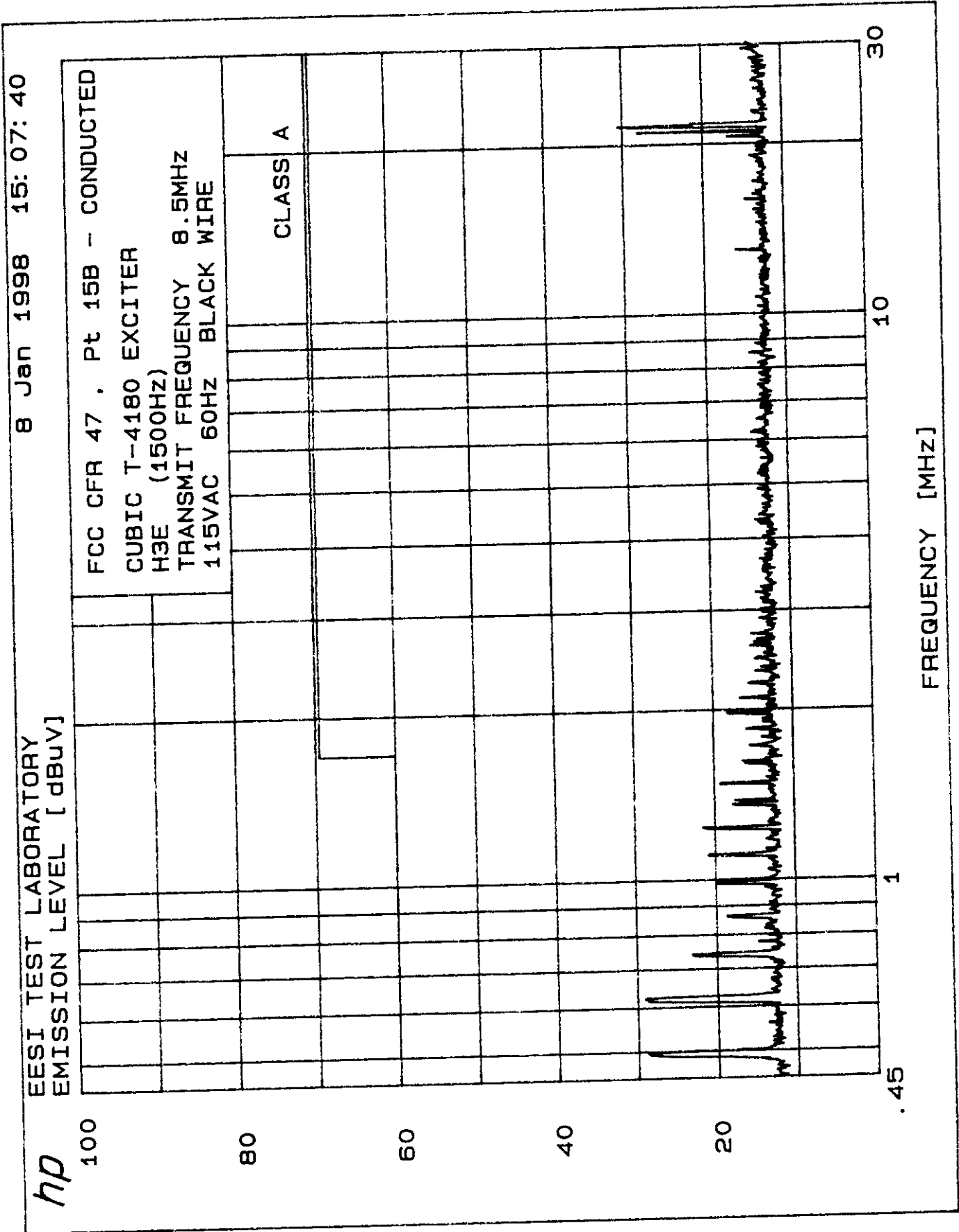


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Electromagnetic Engineering Services, Inc.

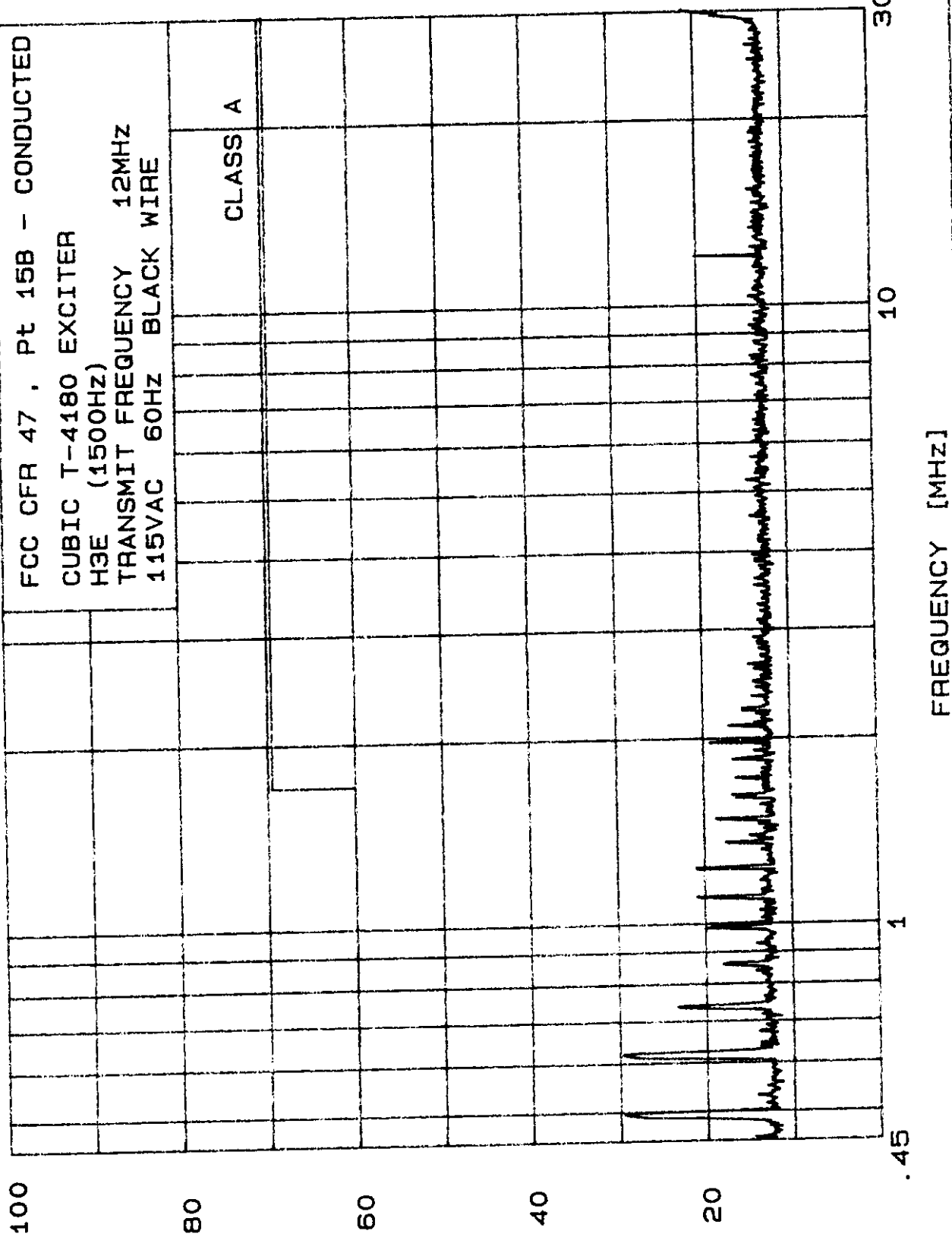
11696 Sorrento Valley Road, Suite. F, San Diego, CA 92121
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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	43

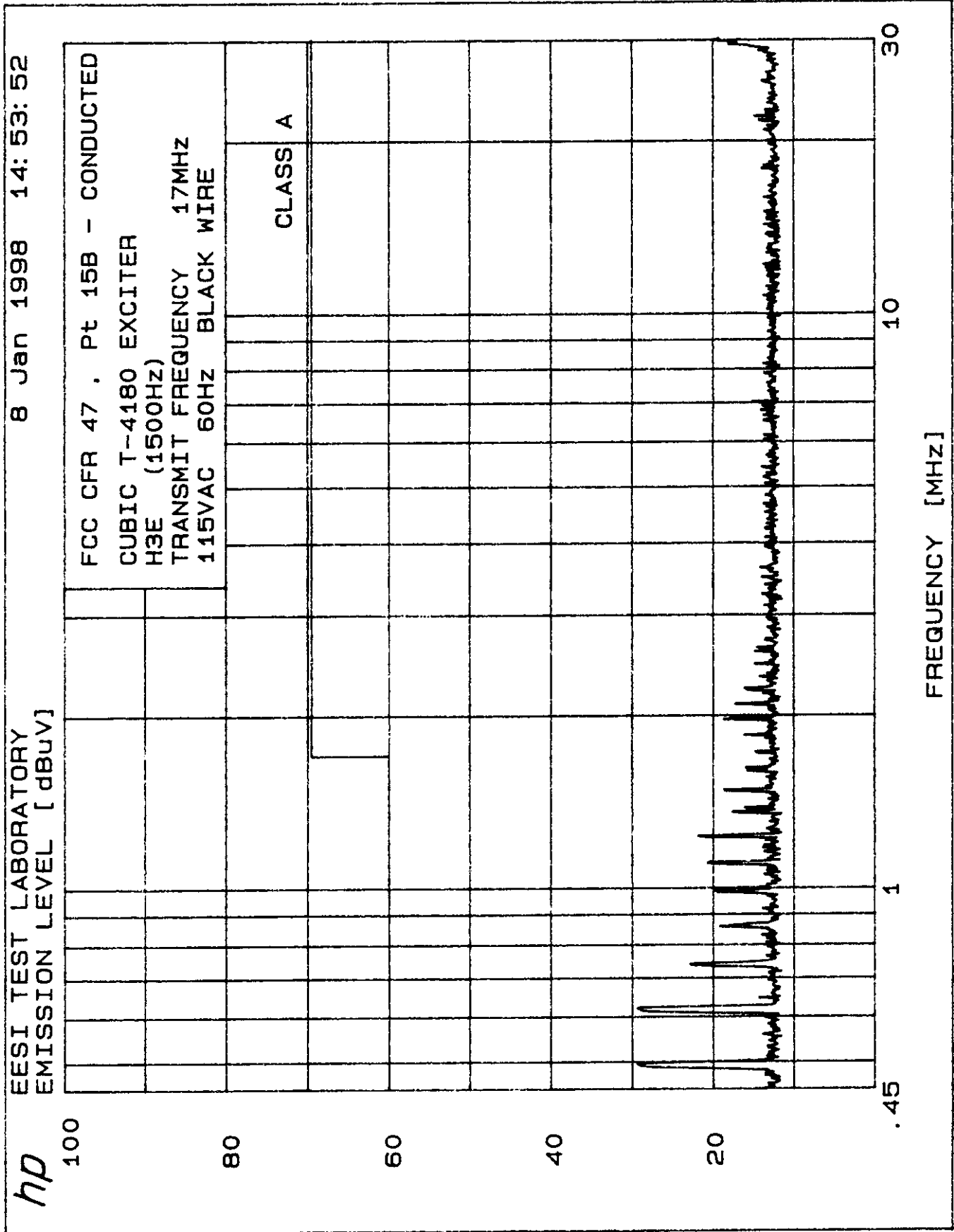


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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	44

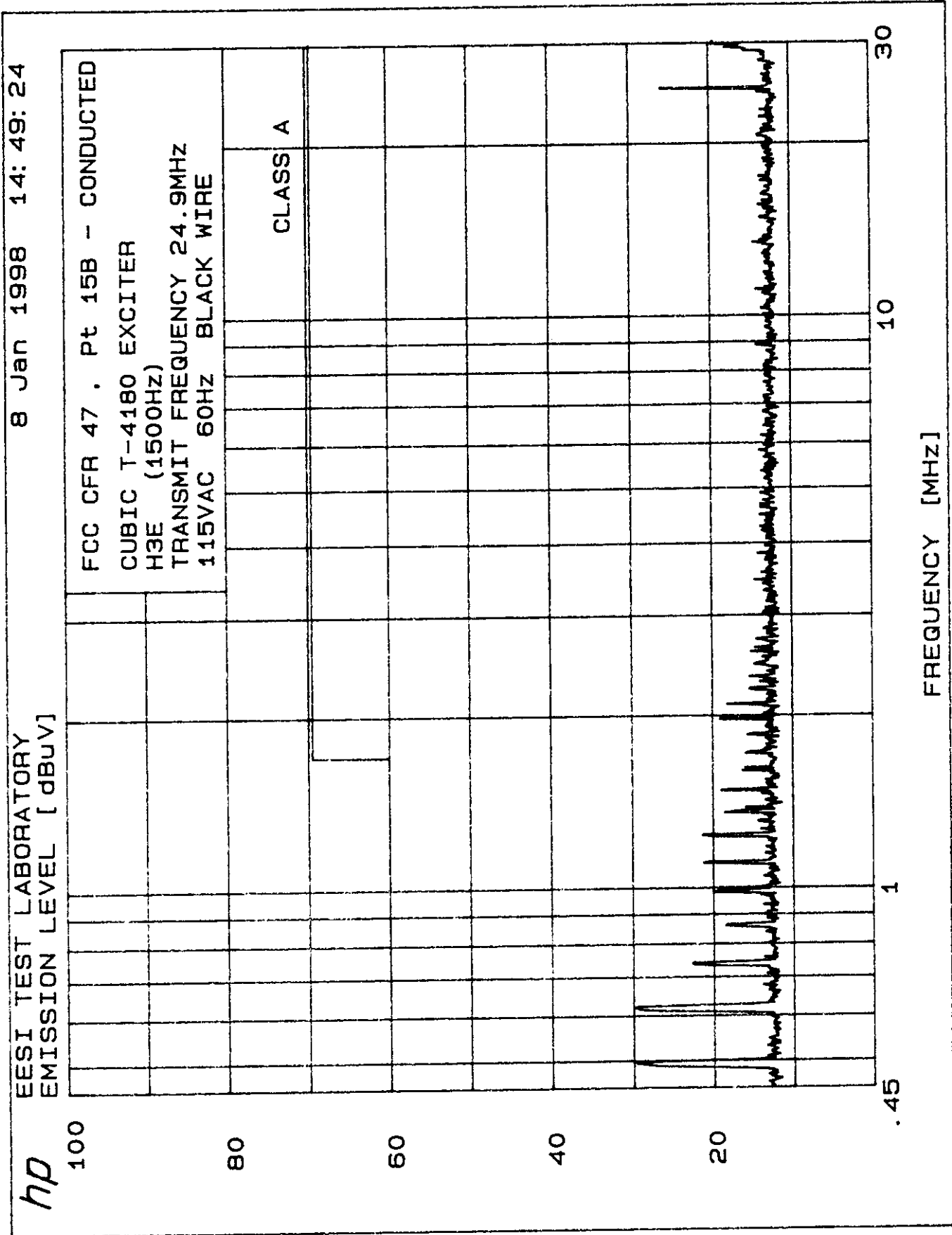
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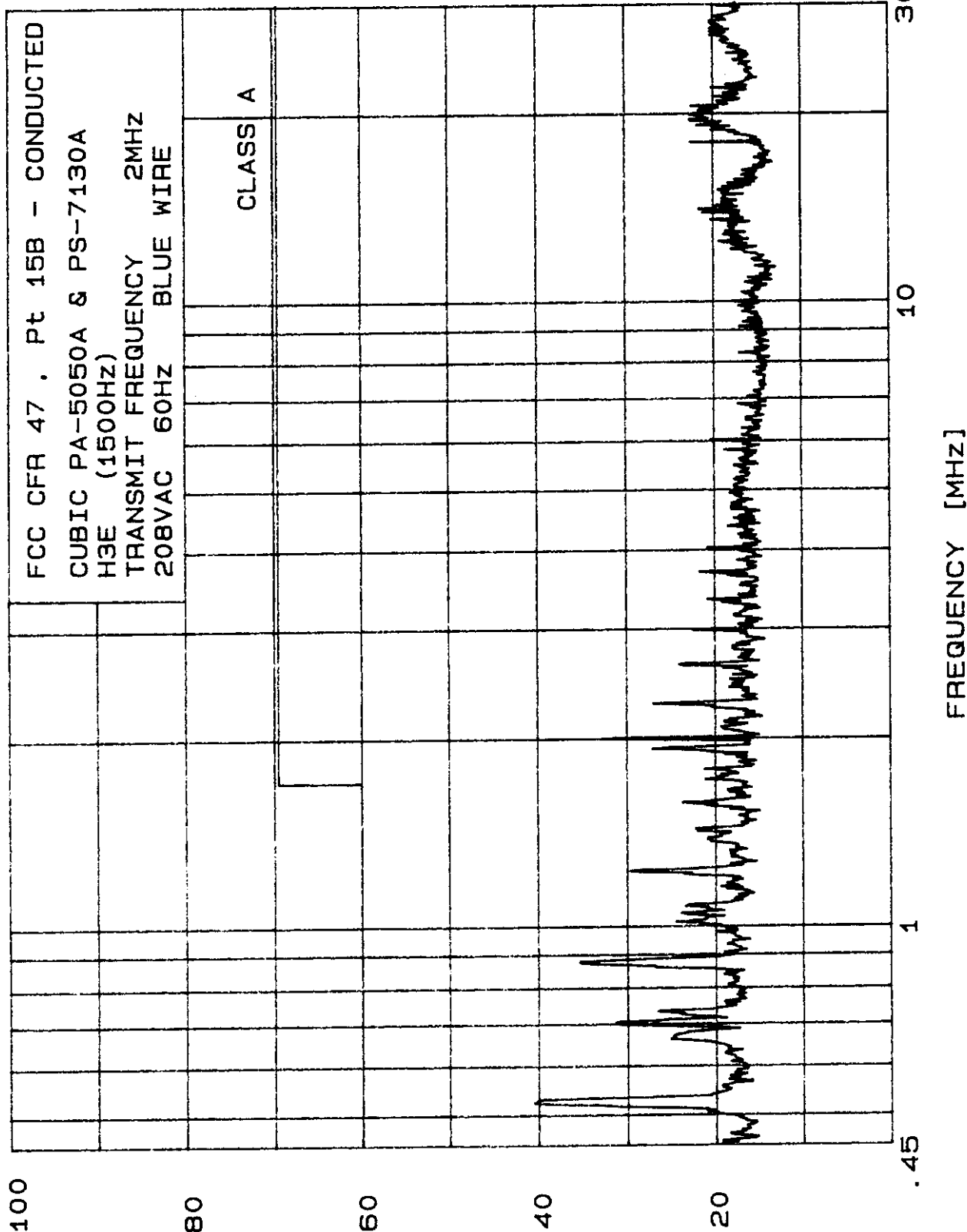


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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	46

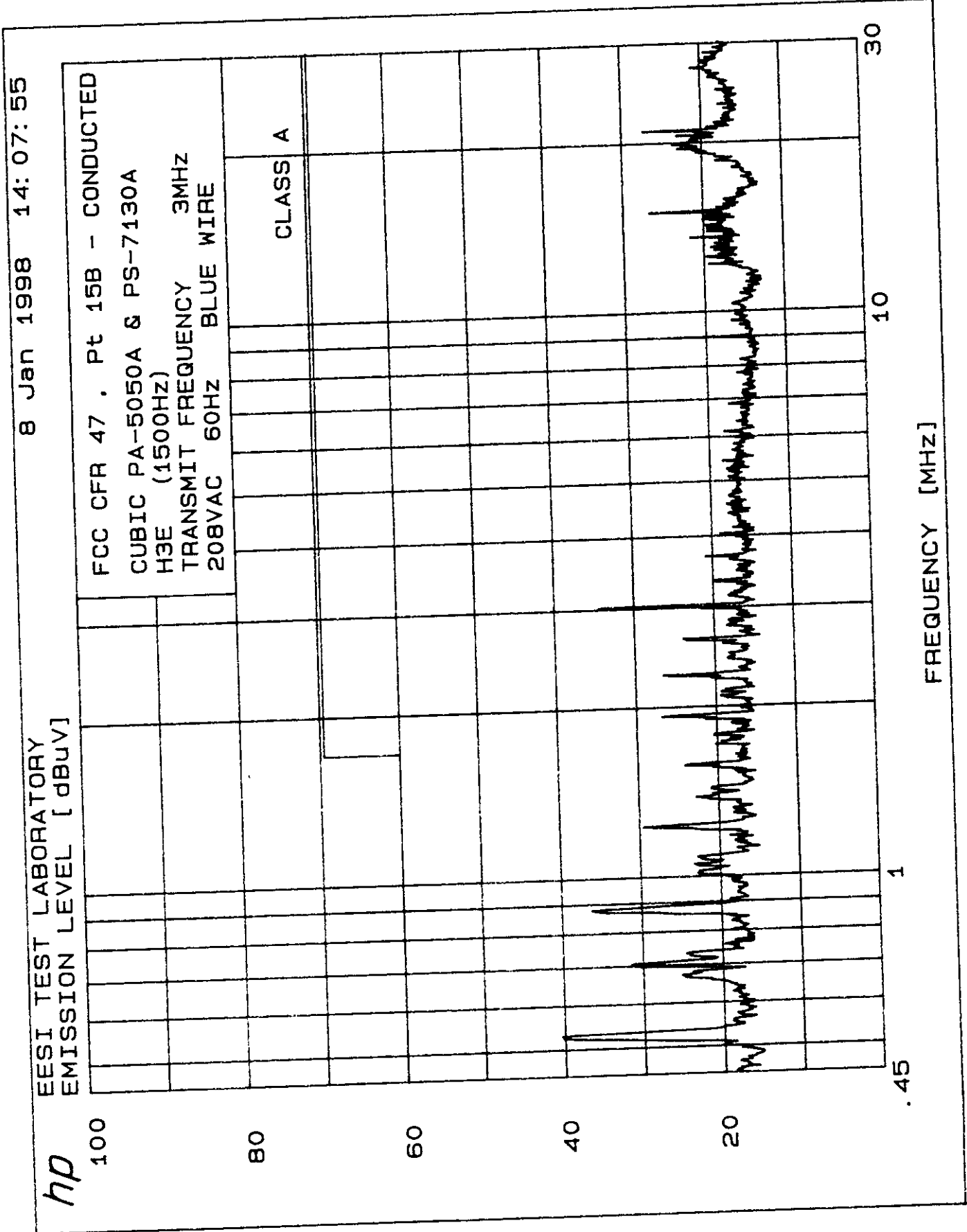


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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCCTX-1000	47

hp EESI TEST LABORATORY
EMISSION LEVEL [dBuV] 8 Jan 1998 14:11:59



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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCIX-1000	48

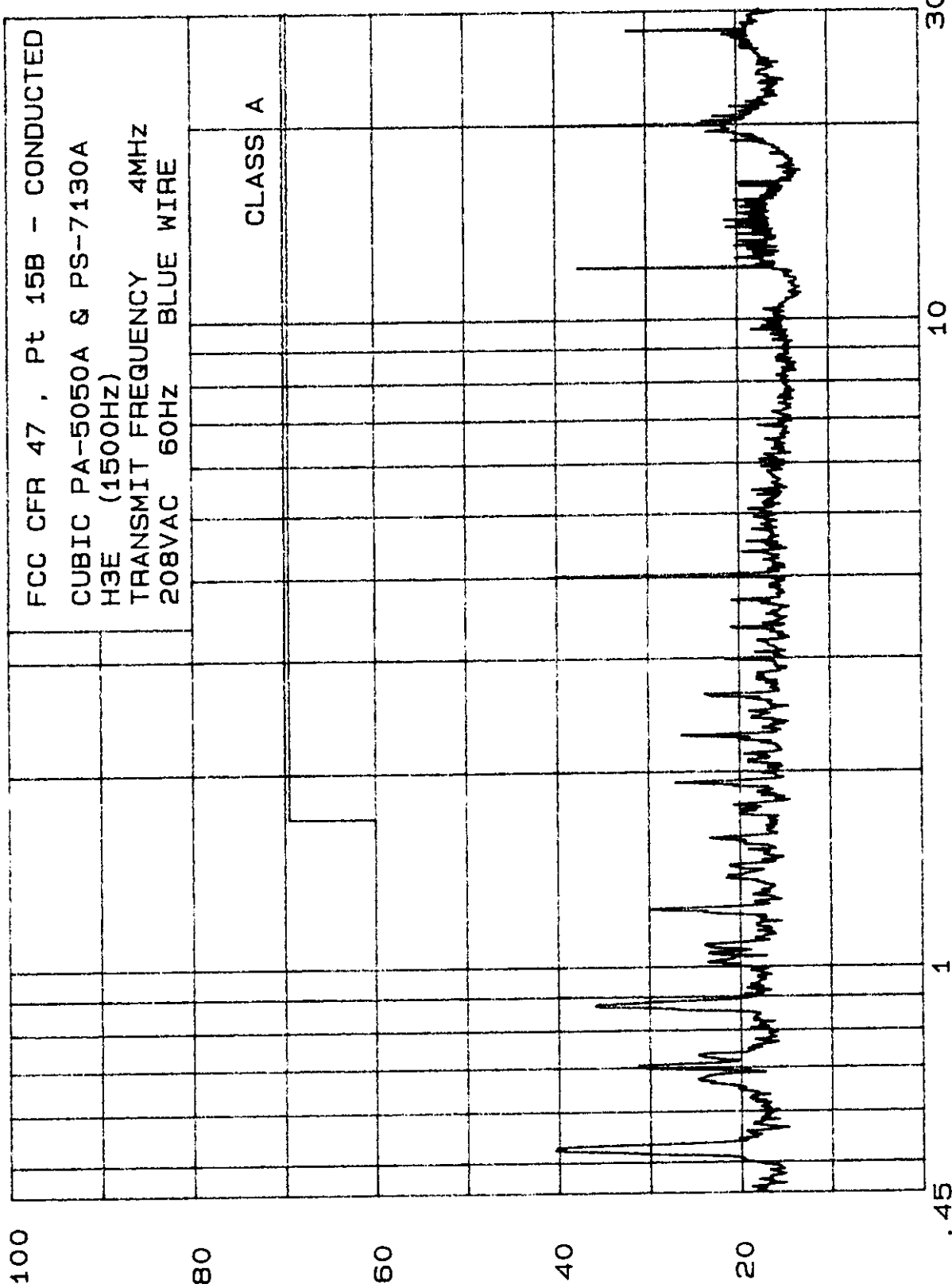


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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	49

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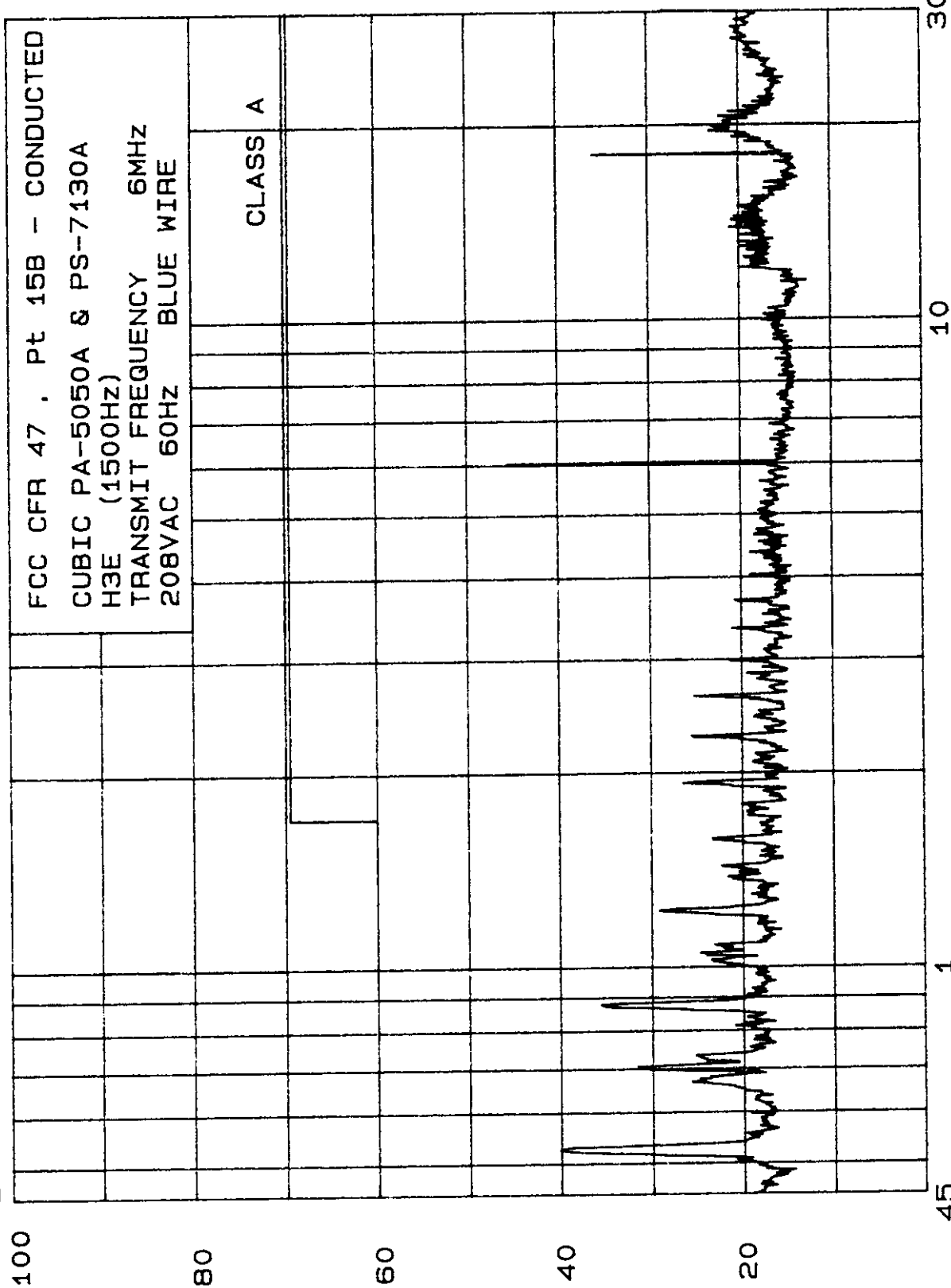
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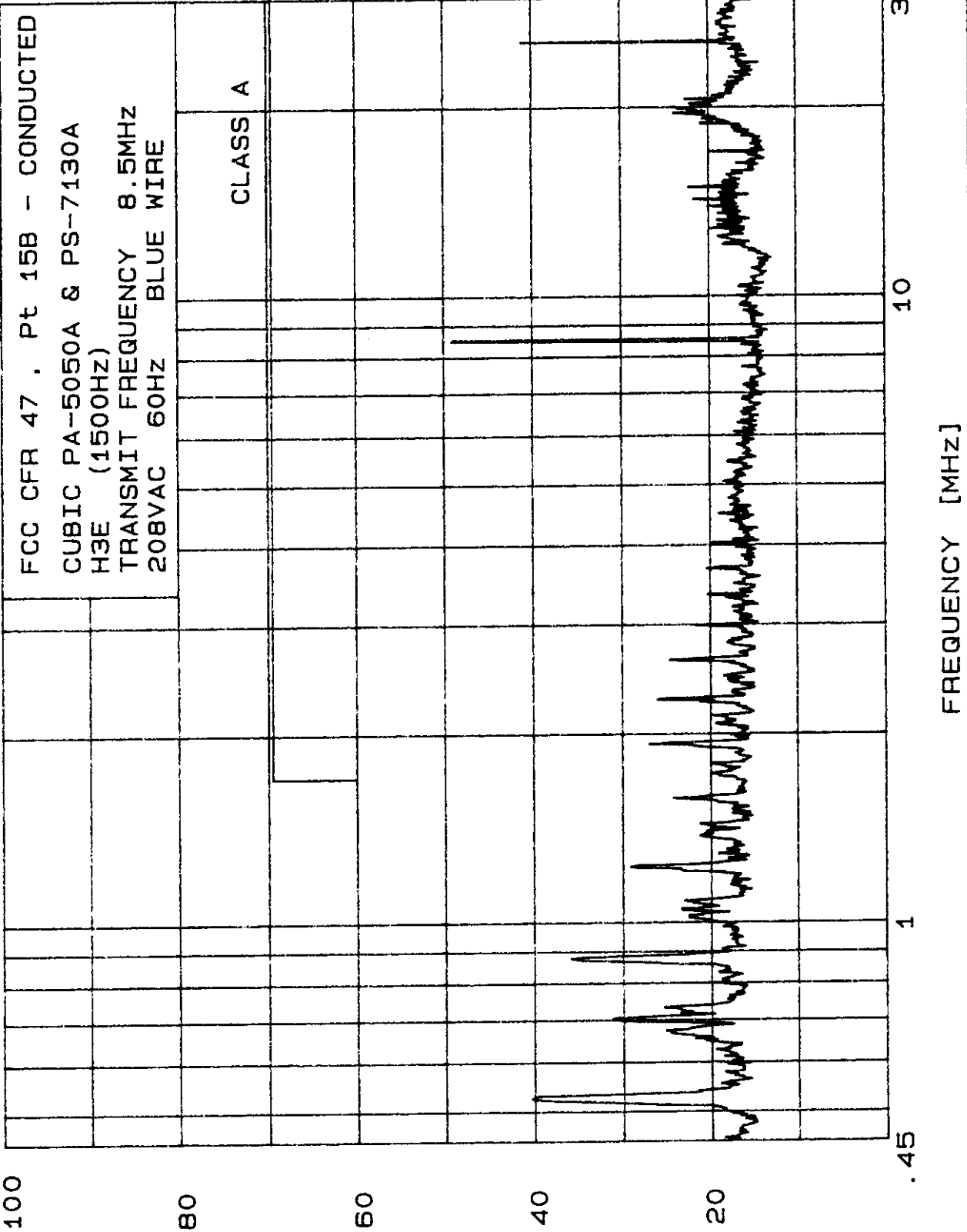
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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	50

8 Jan 1998 13:56:34

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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	51

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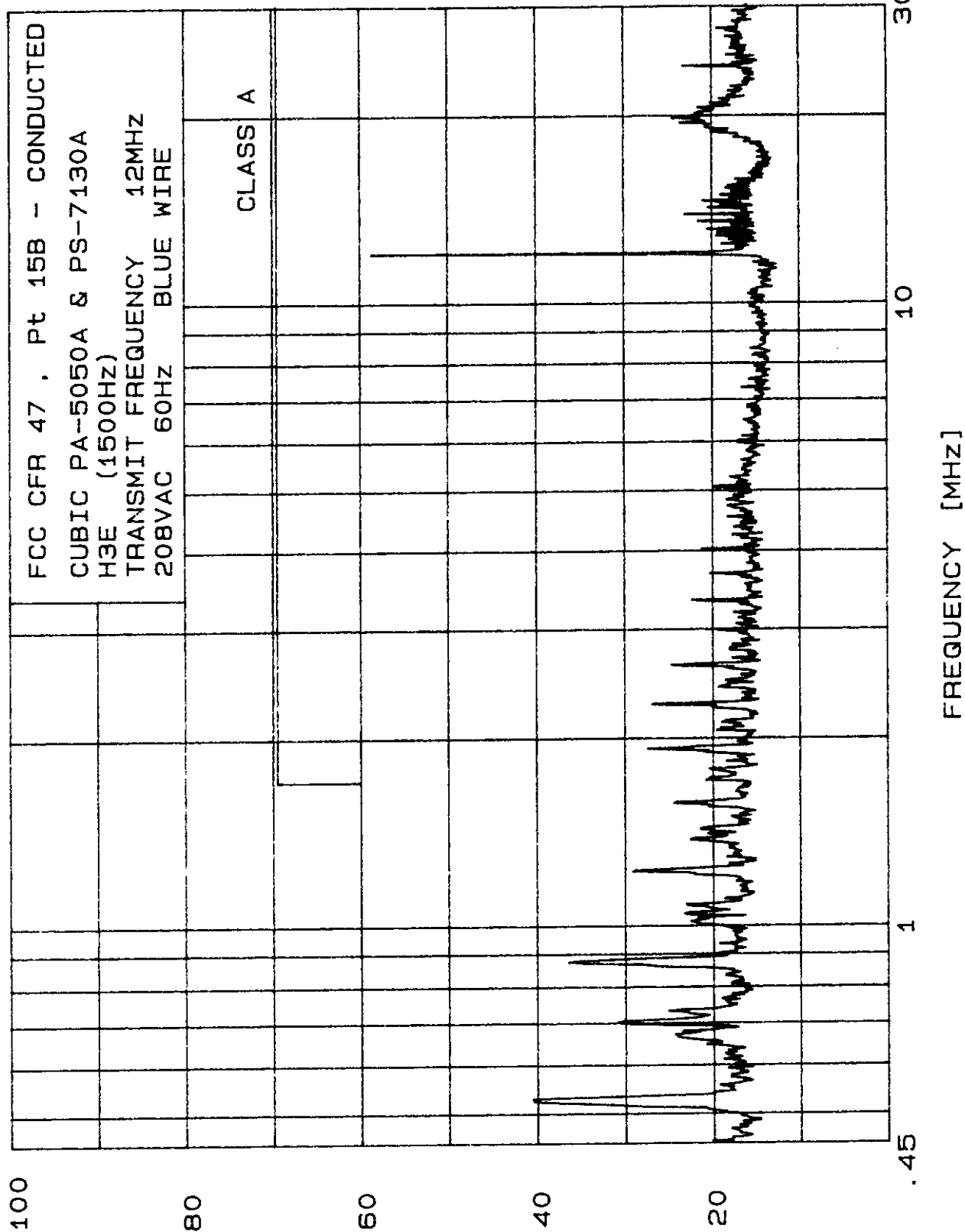


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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	52

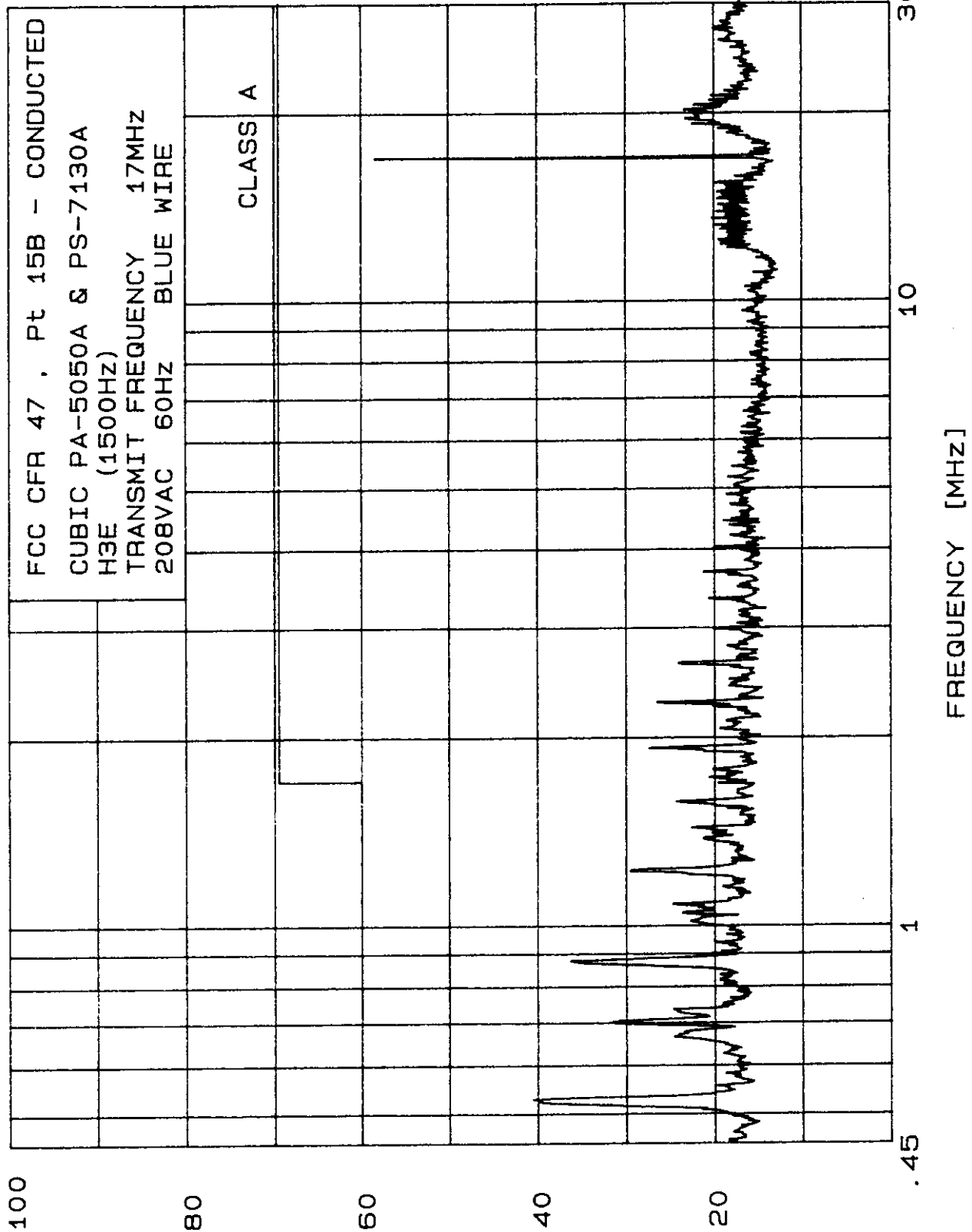
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EMISSION LEVEL [dBuV]

8 Jan 1998 13: 47: 26

hp



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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	53

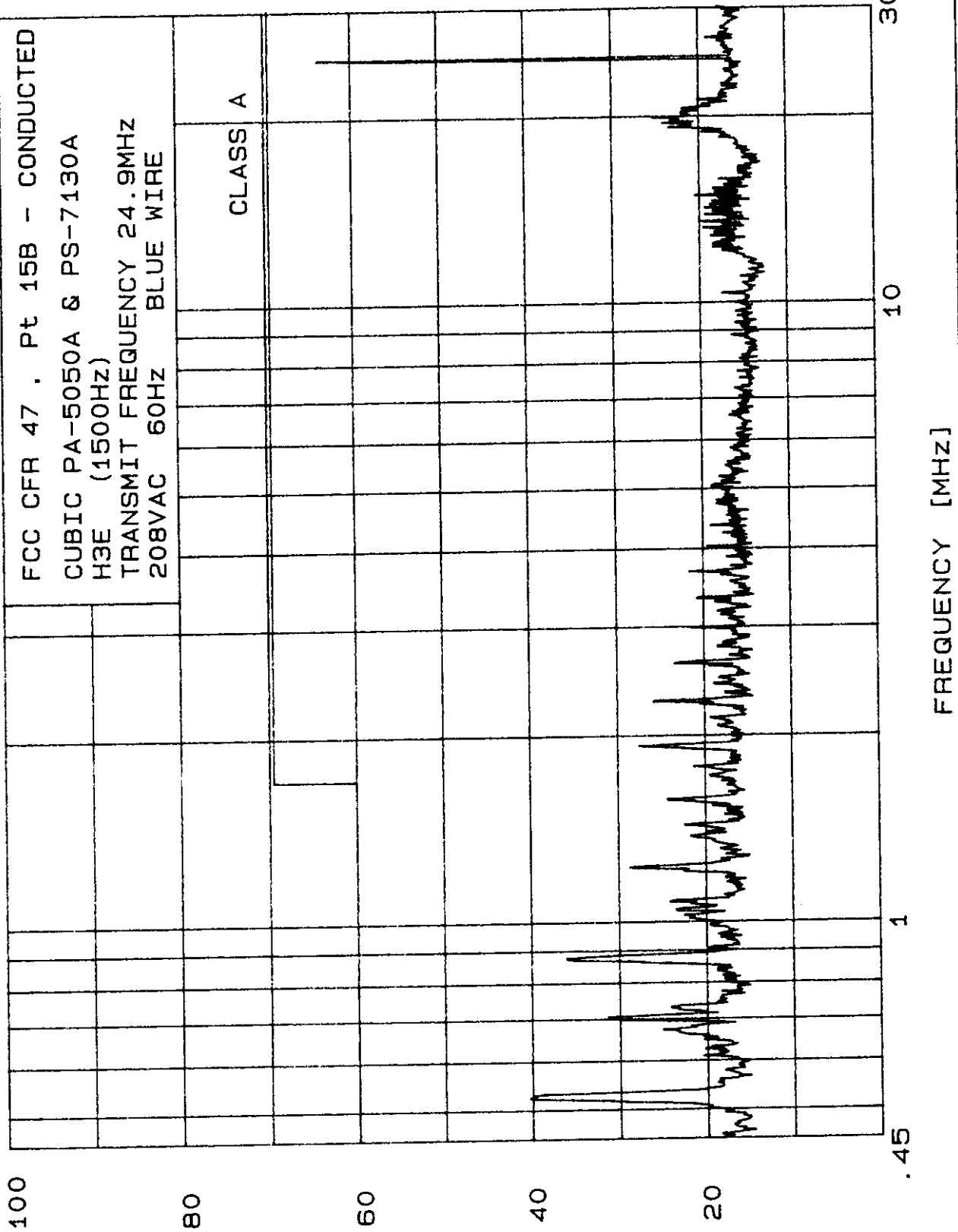
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EESI TEST LABORATORY
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8 Jan 1998 13:37:19

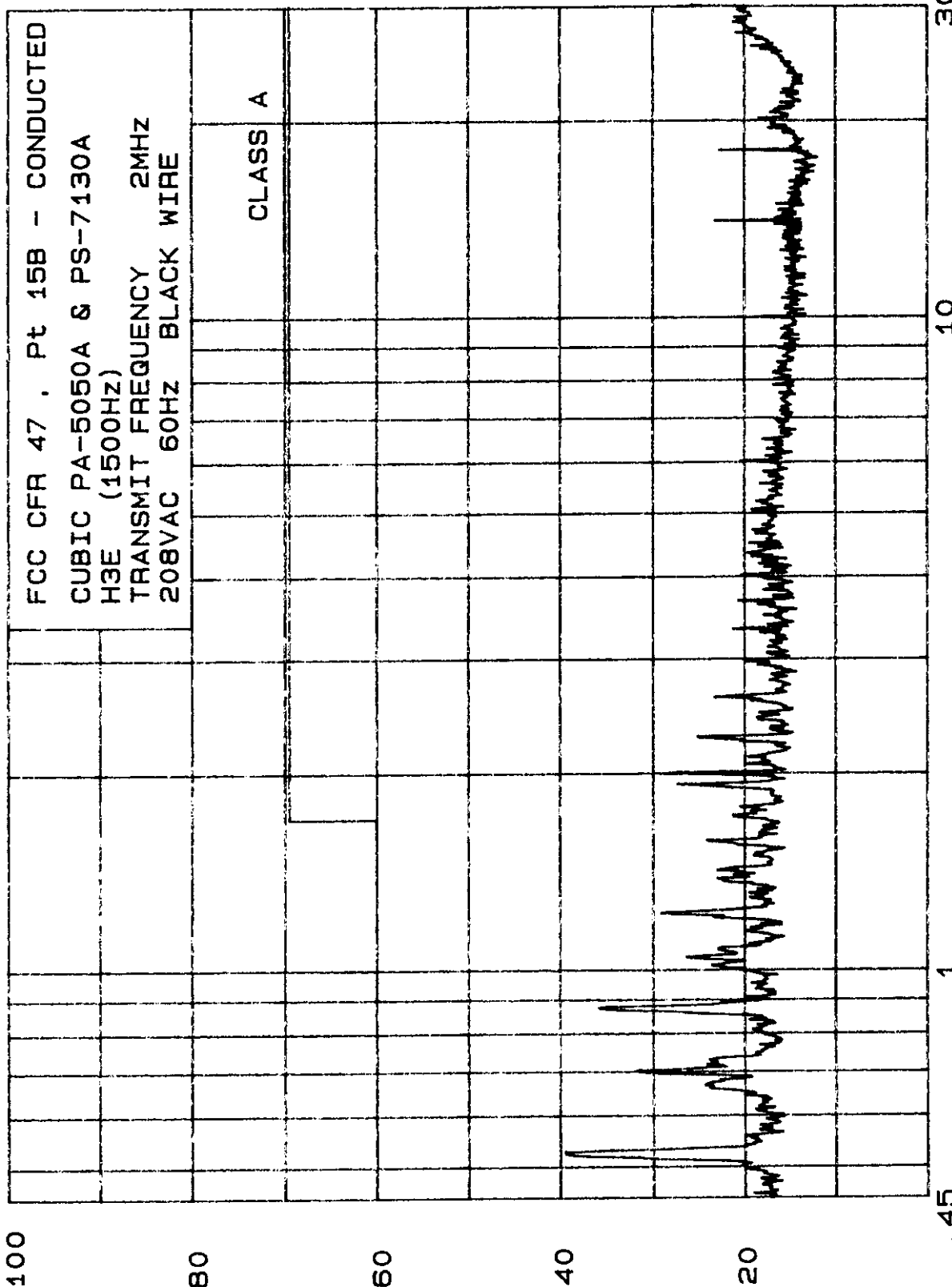
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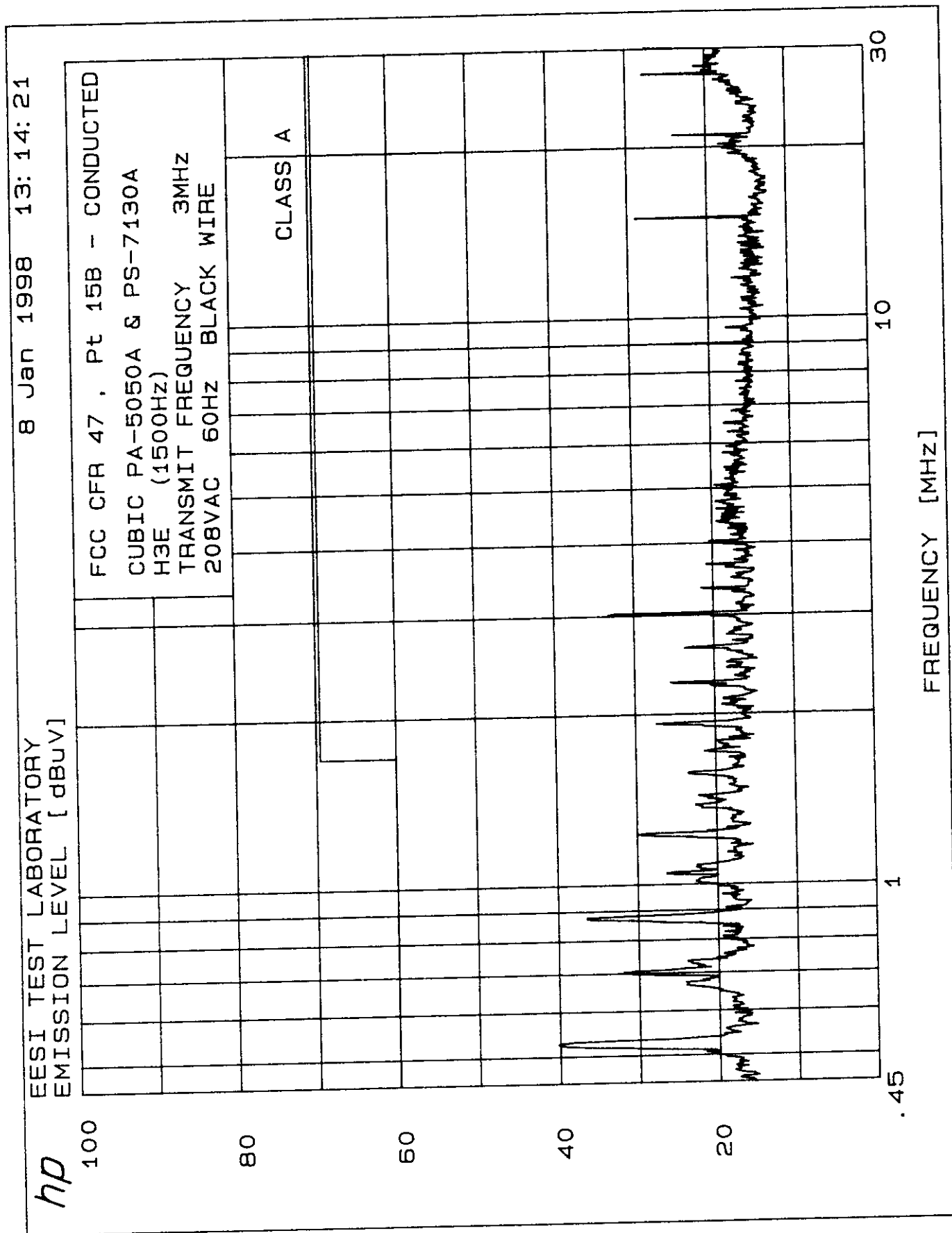
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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	55

8 Jan 1998 12:43:48

EESI TEST LABORATORY
EMISSION LEVEL [dBuV]



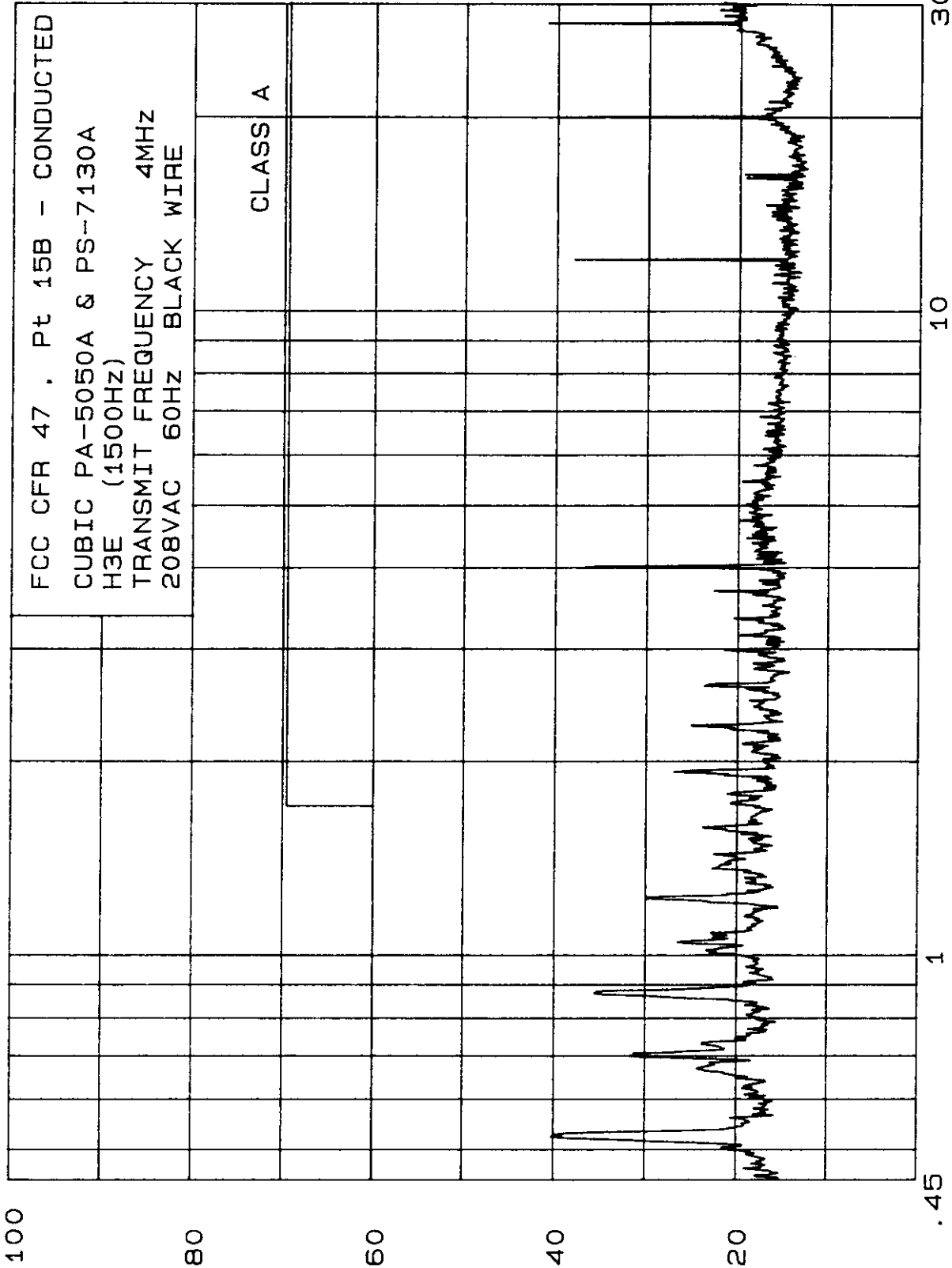
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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	57

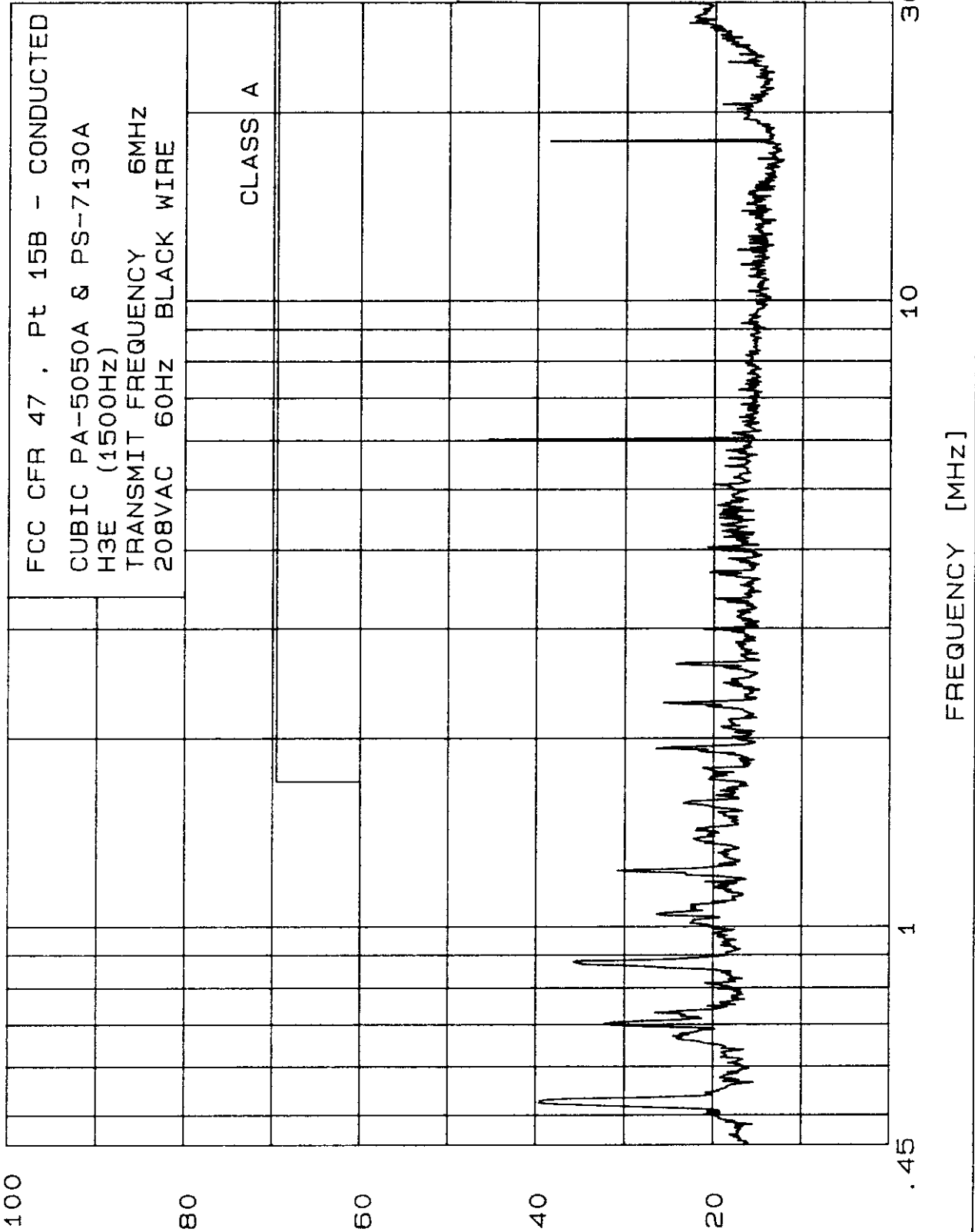
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EMISSION LEVEL [dBuV]

8 Jan 1998 13:10:28



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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	58

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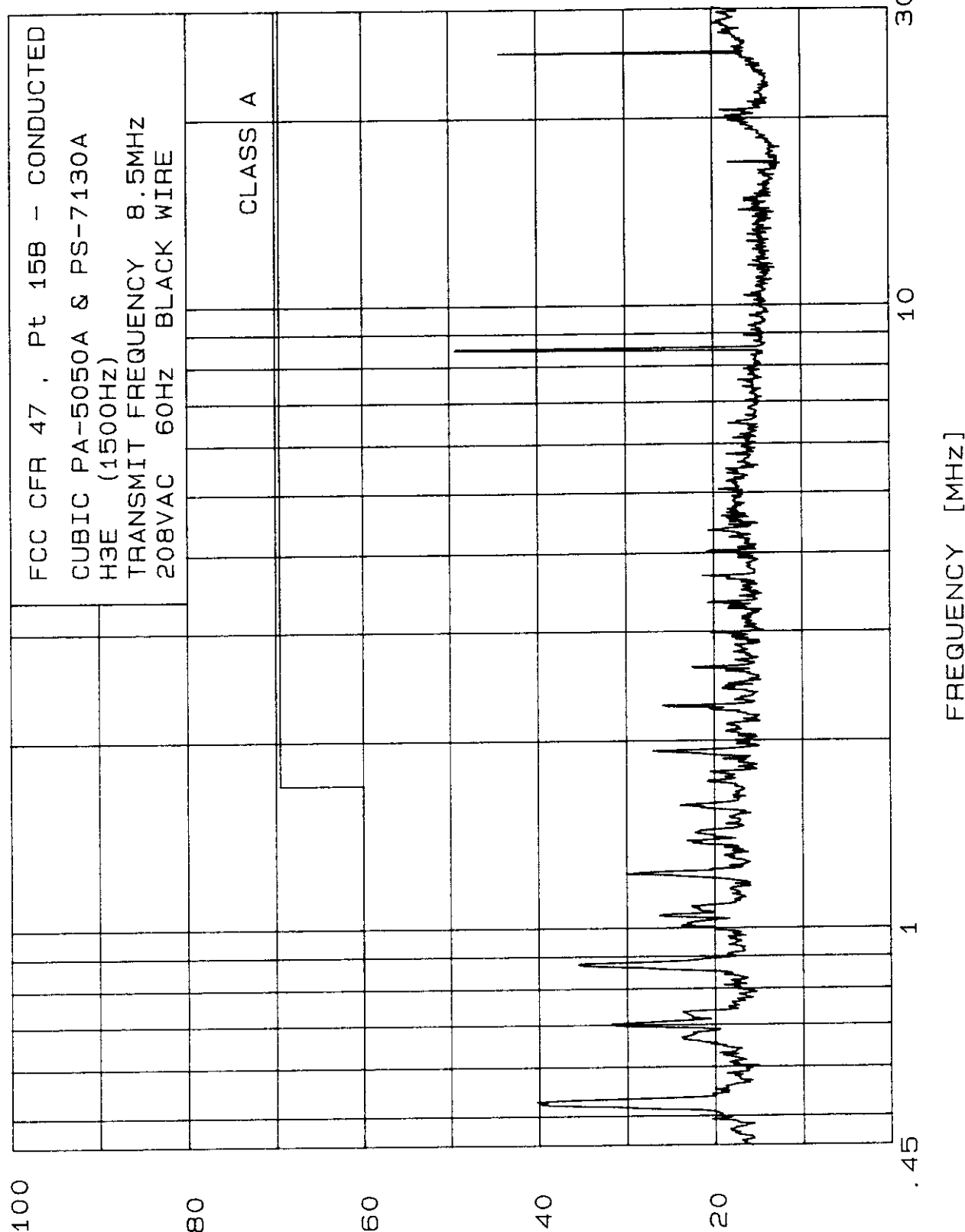


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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	59

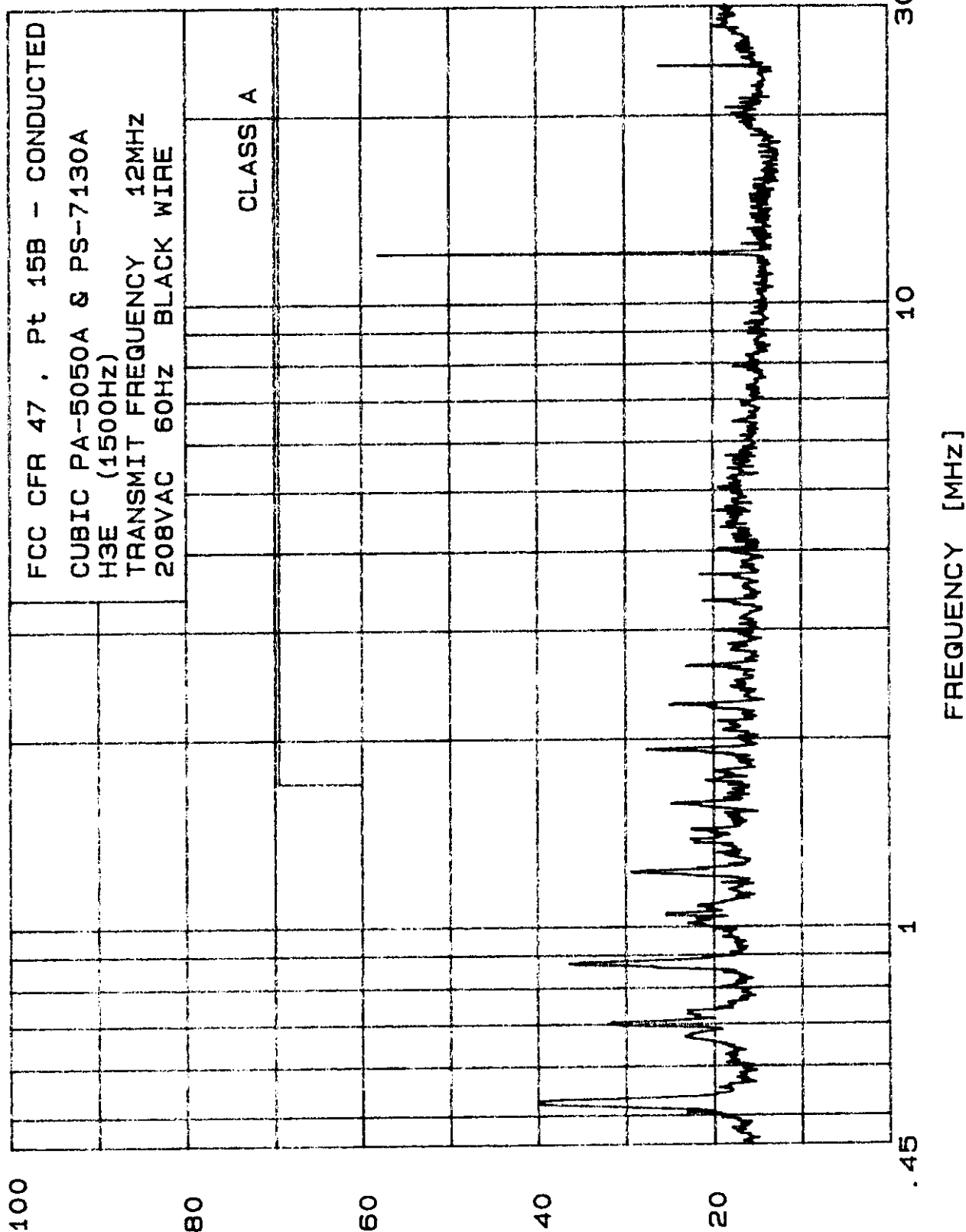
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8 Jan 1998 13:01:20

hp

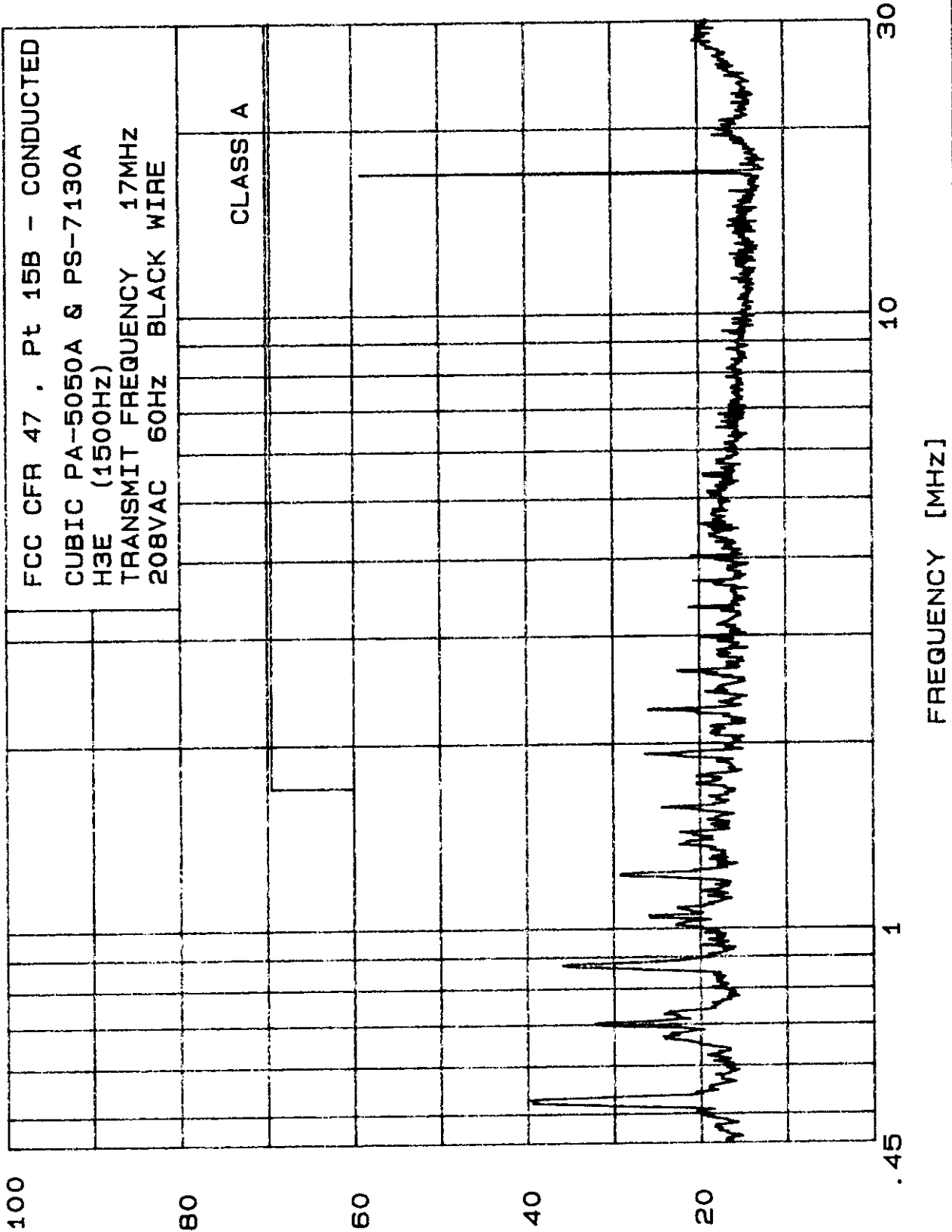


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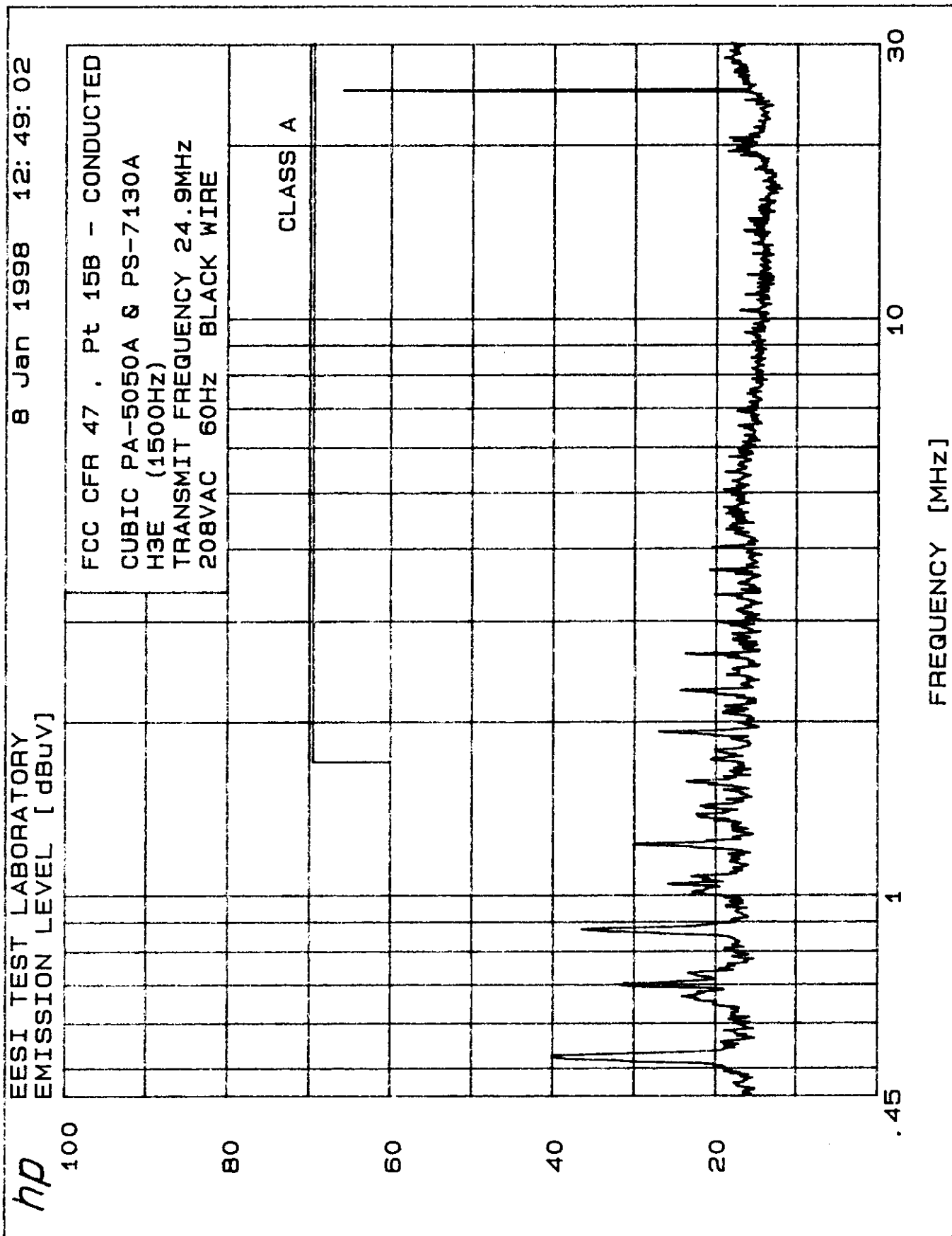
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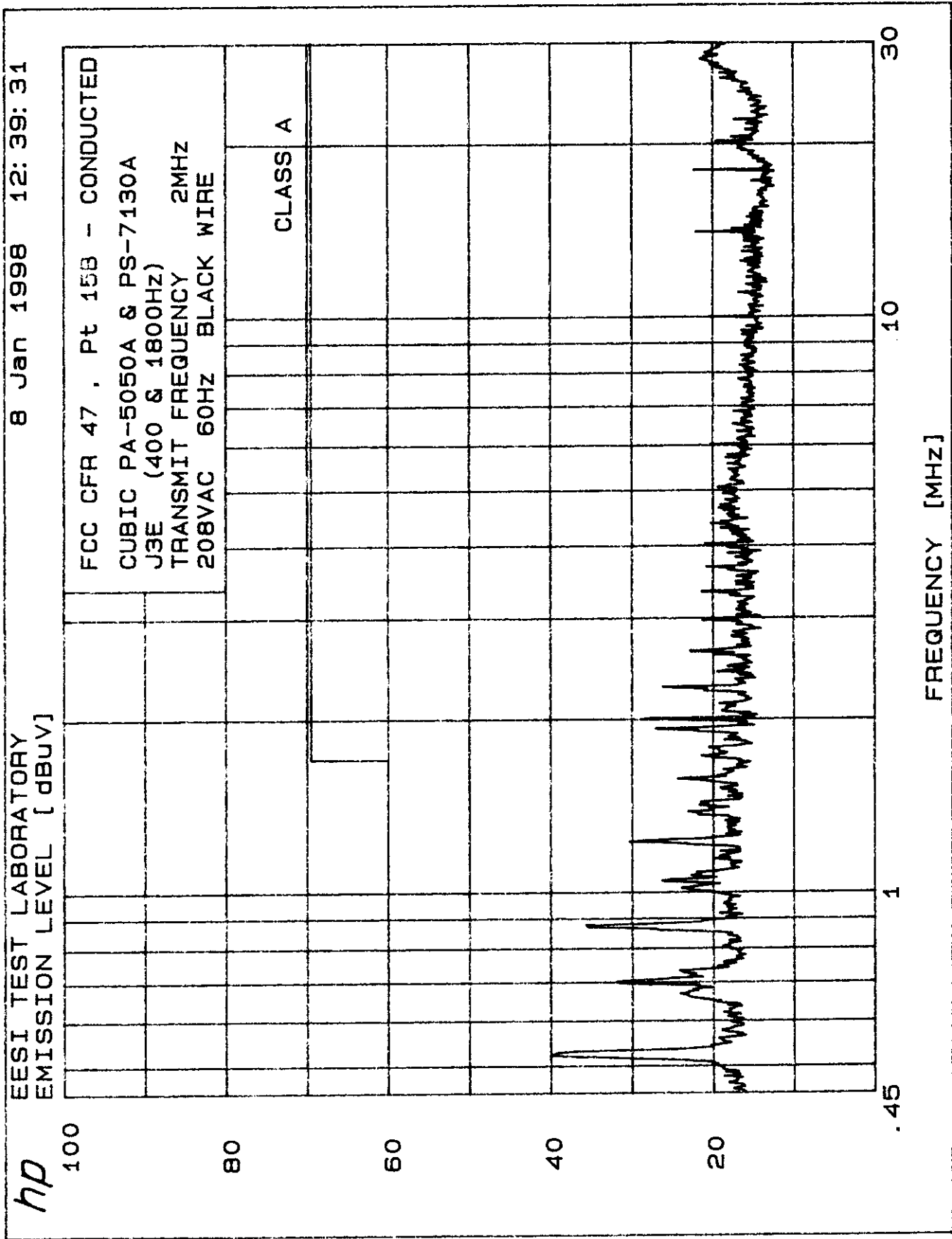
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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	61

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EMISSION LEVEL [dBuV]



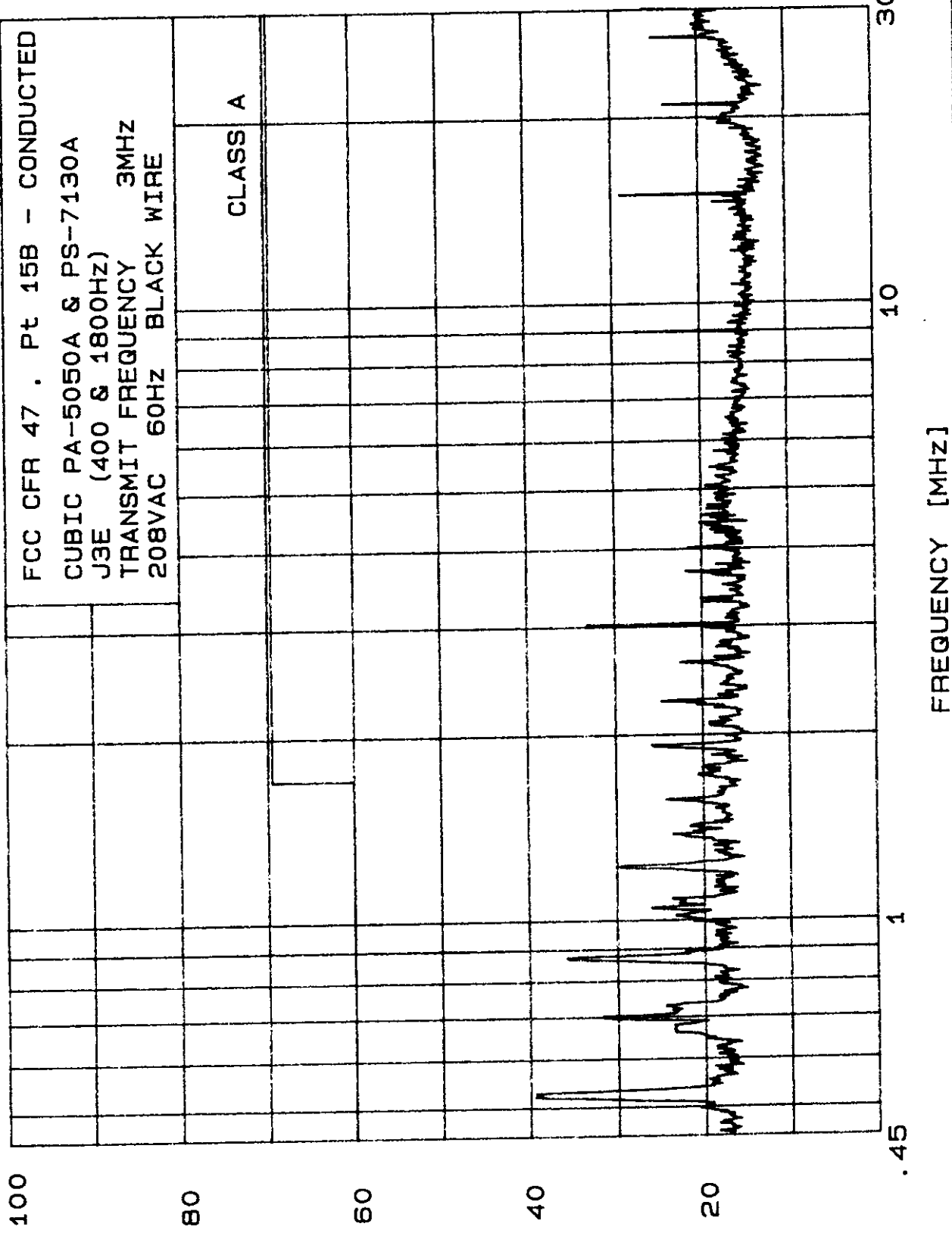
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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	62



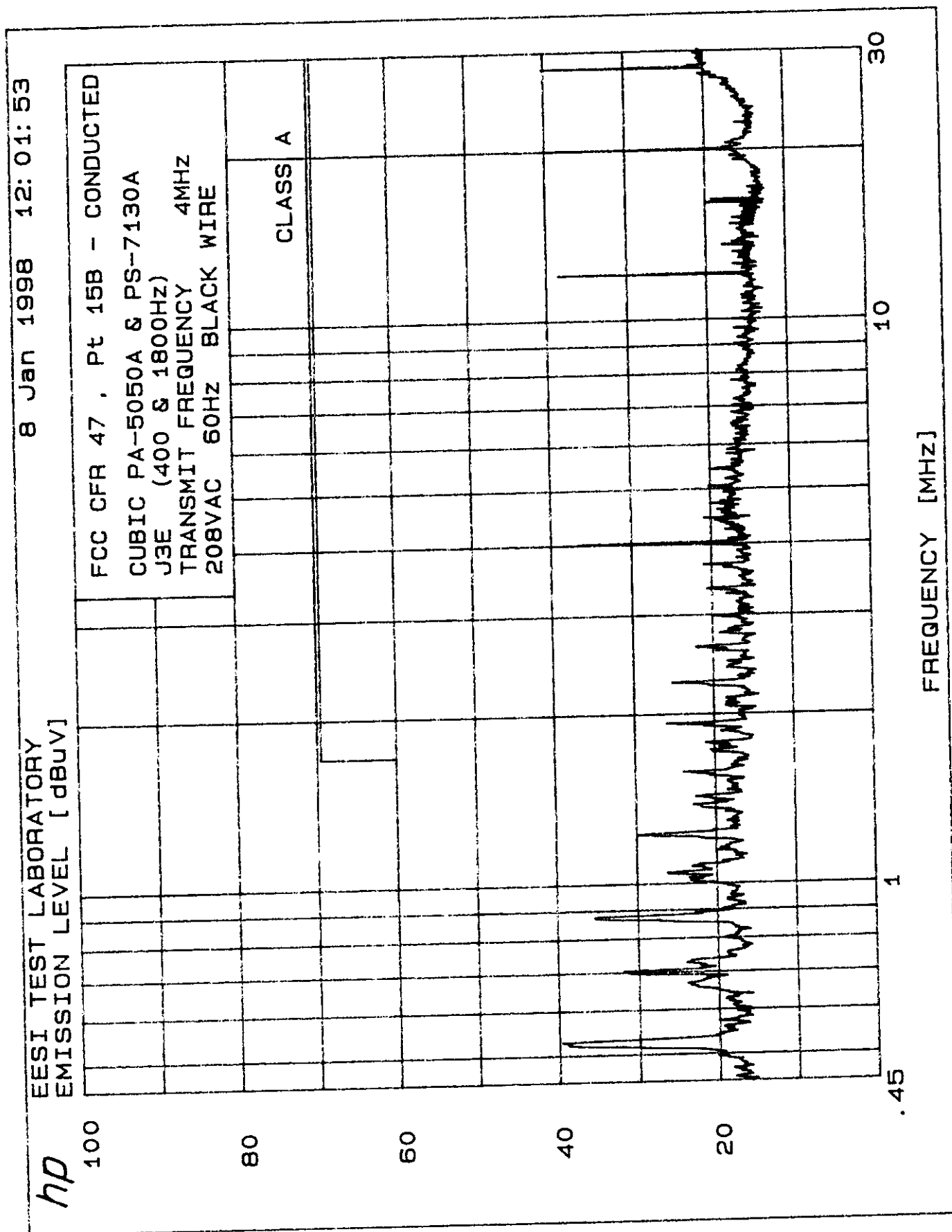


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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	64

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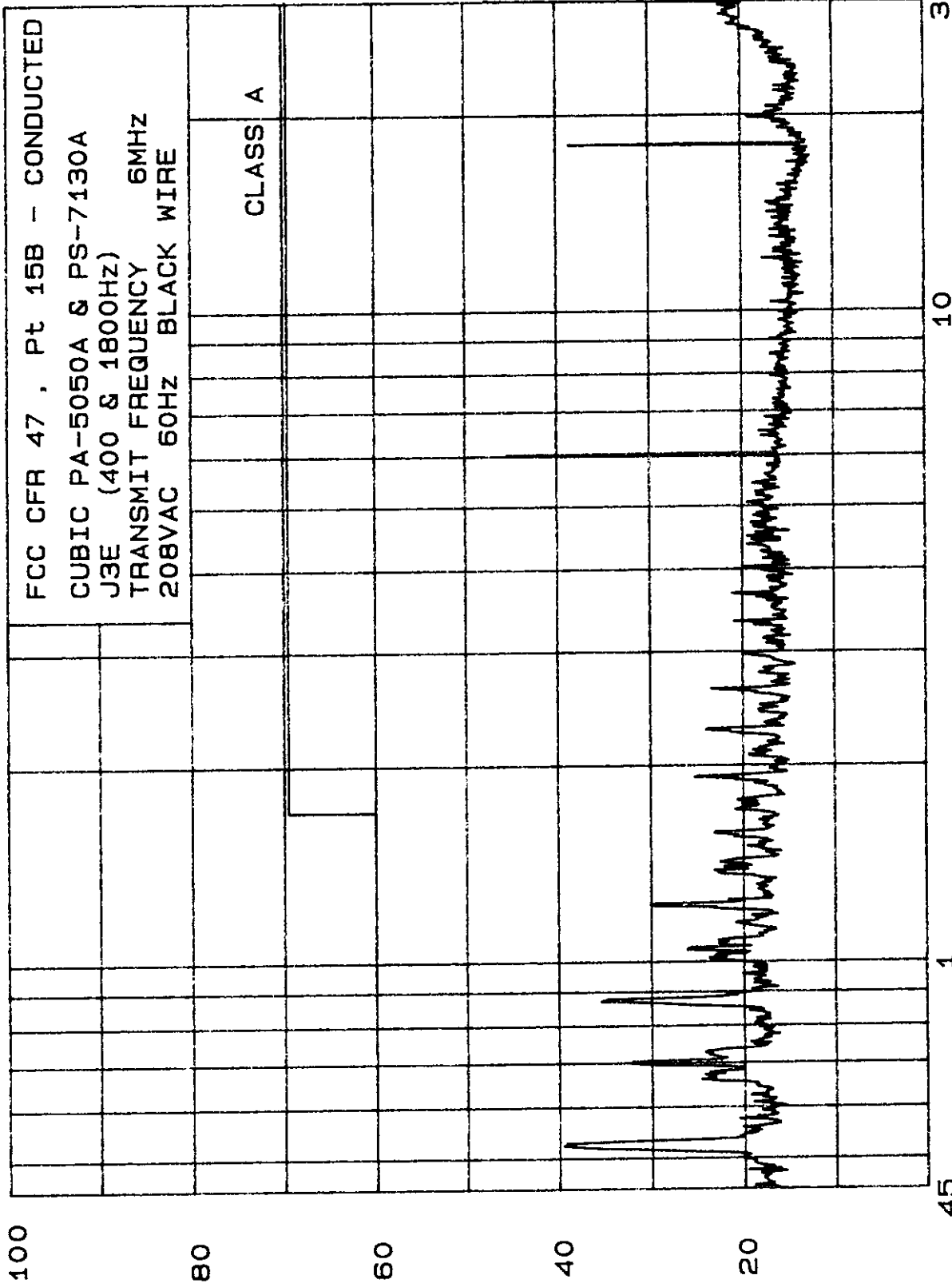


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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	65

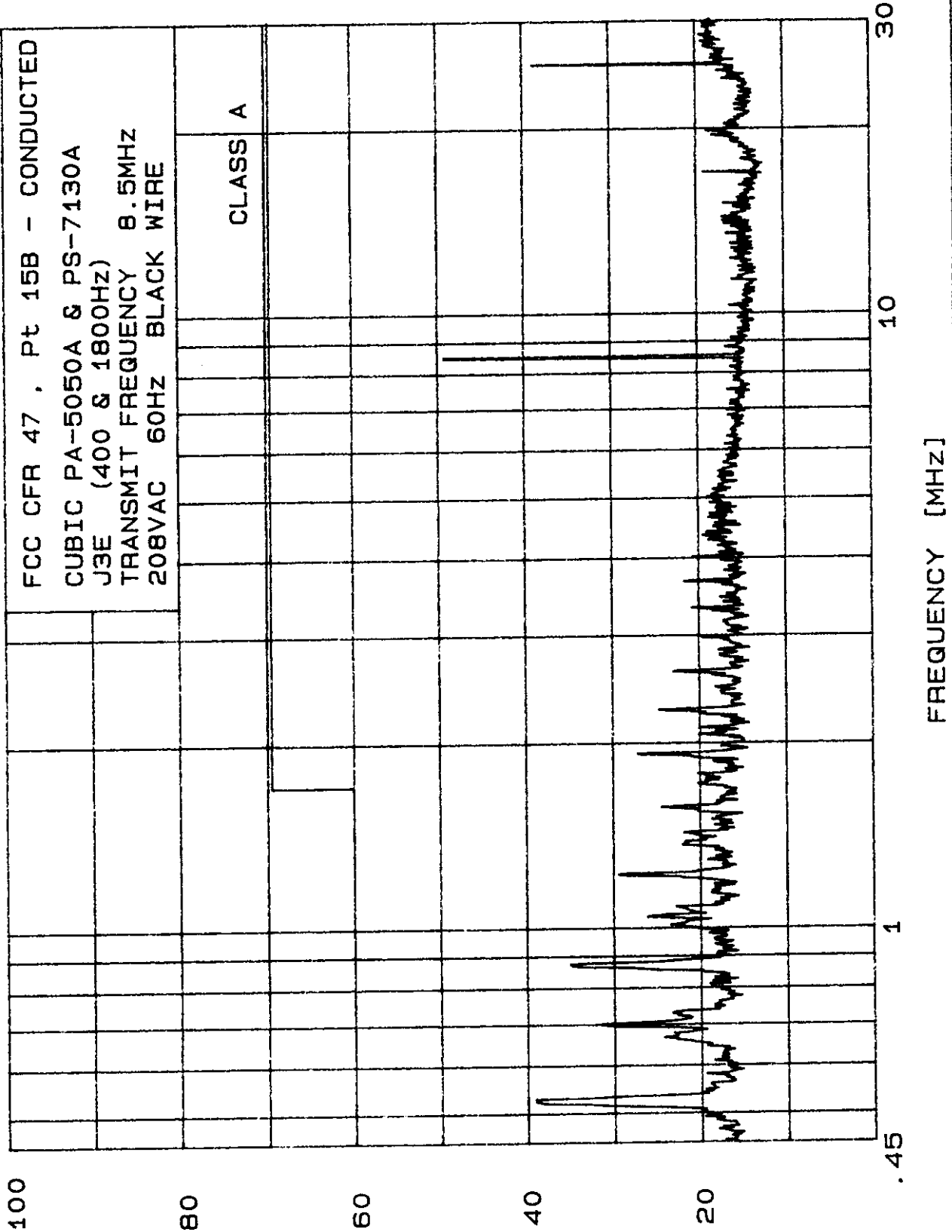


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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	66

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EMISSION LEVEL [dBuV]



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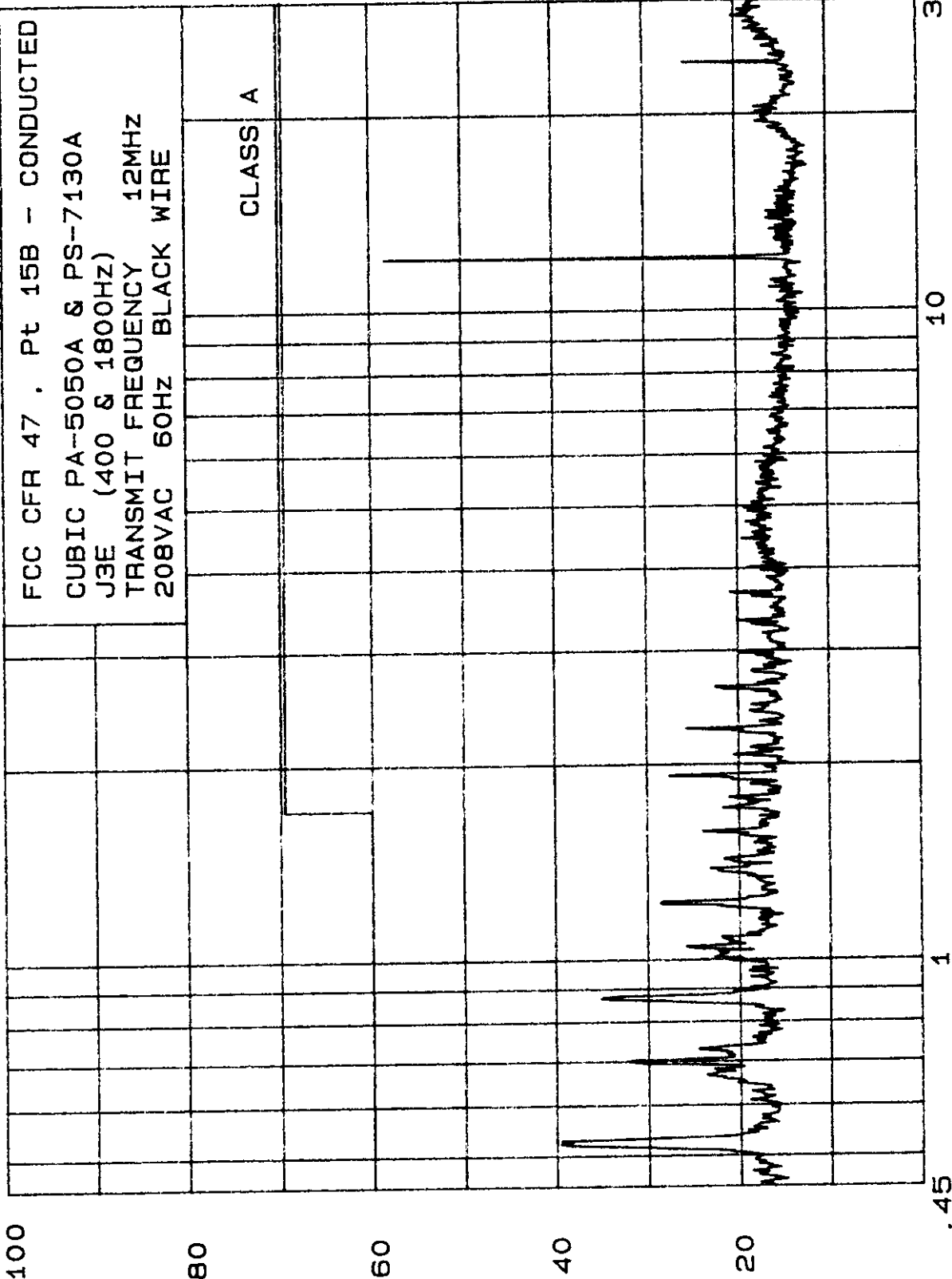
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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	68

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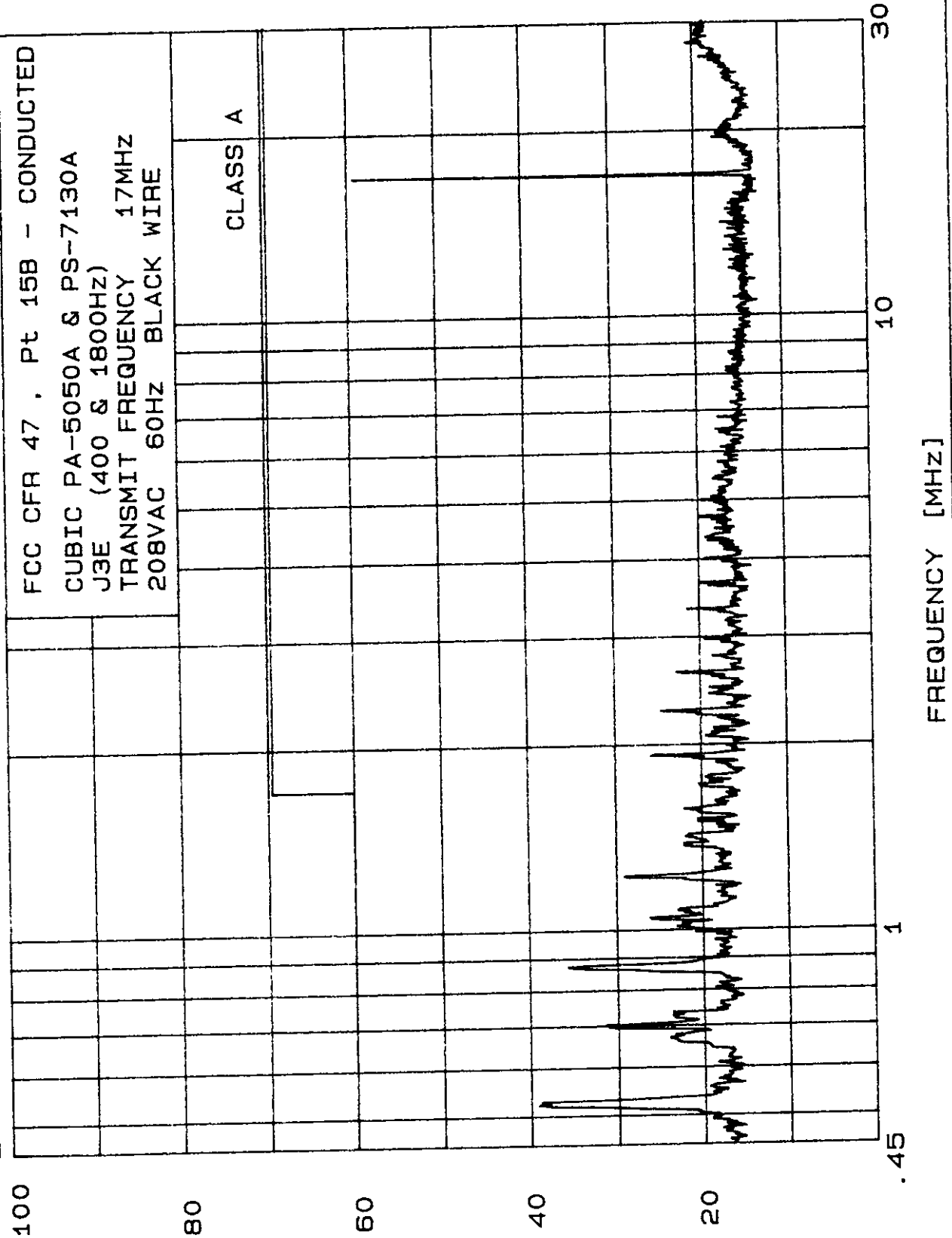
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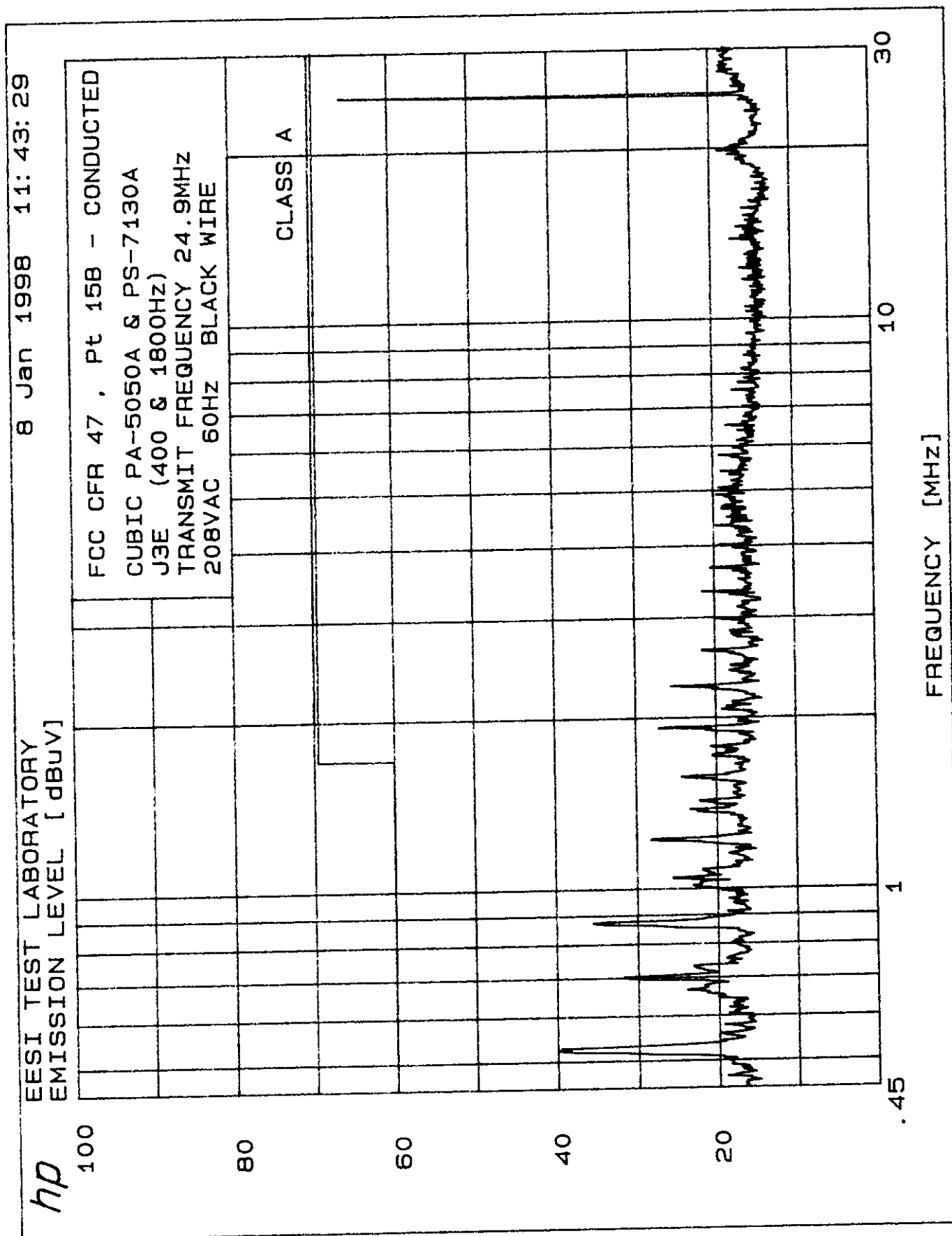
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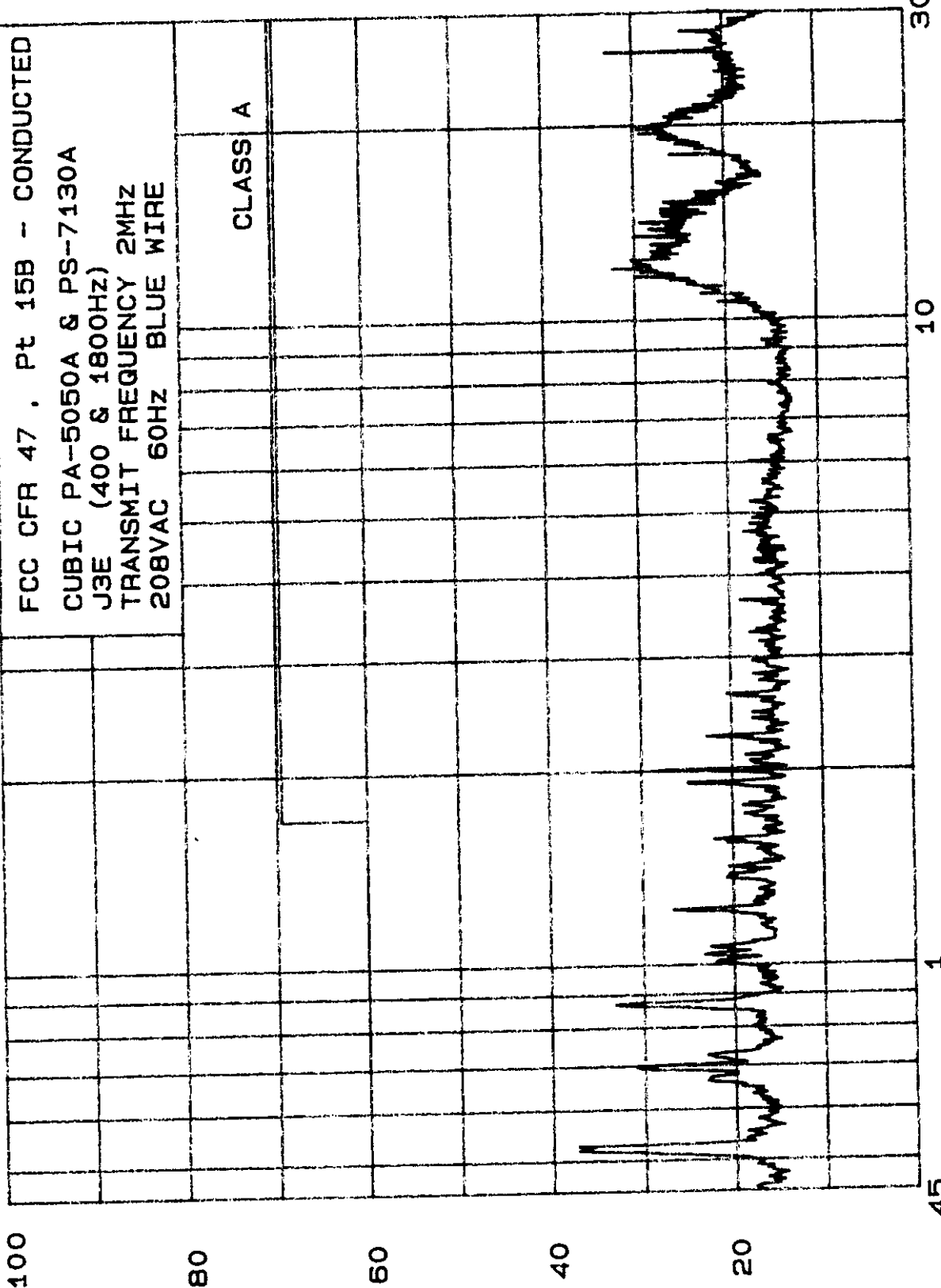


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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	71

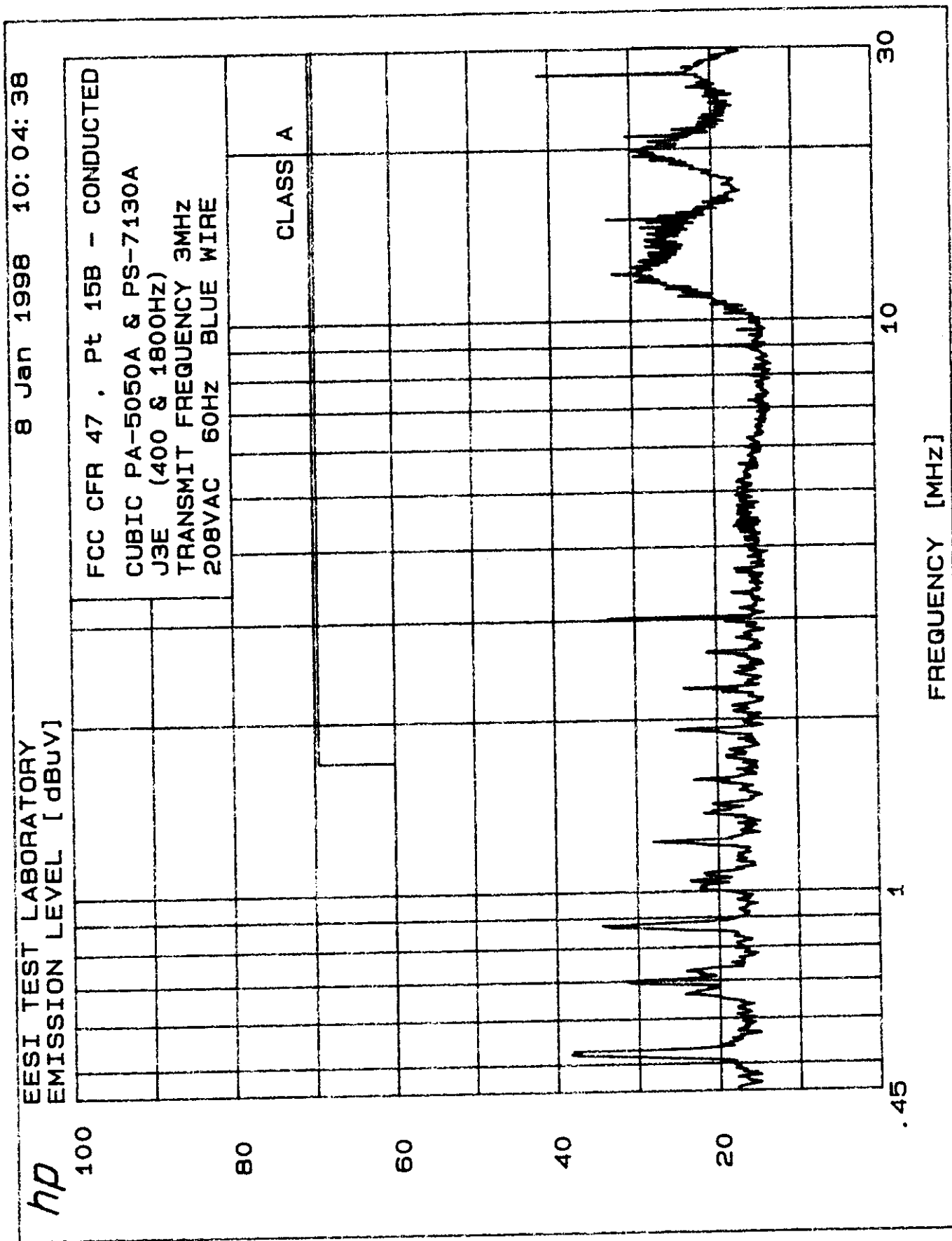
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EMISSION LEVEL [dBuV]

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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	72

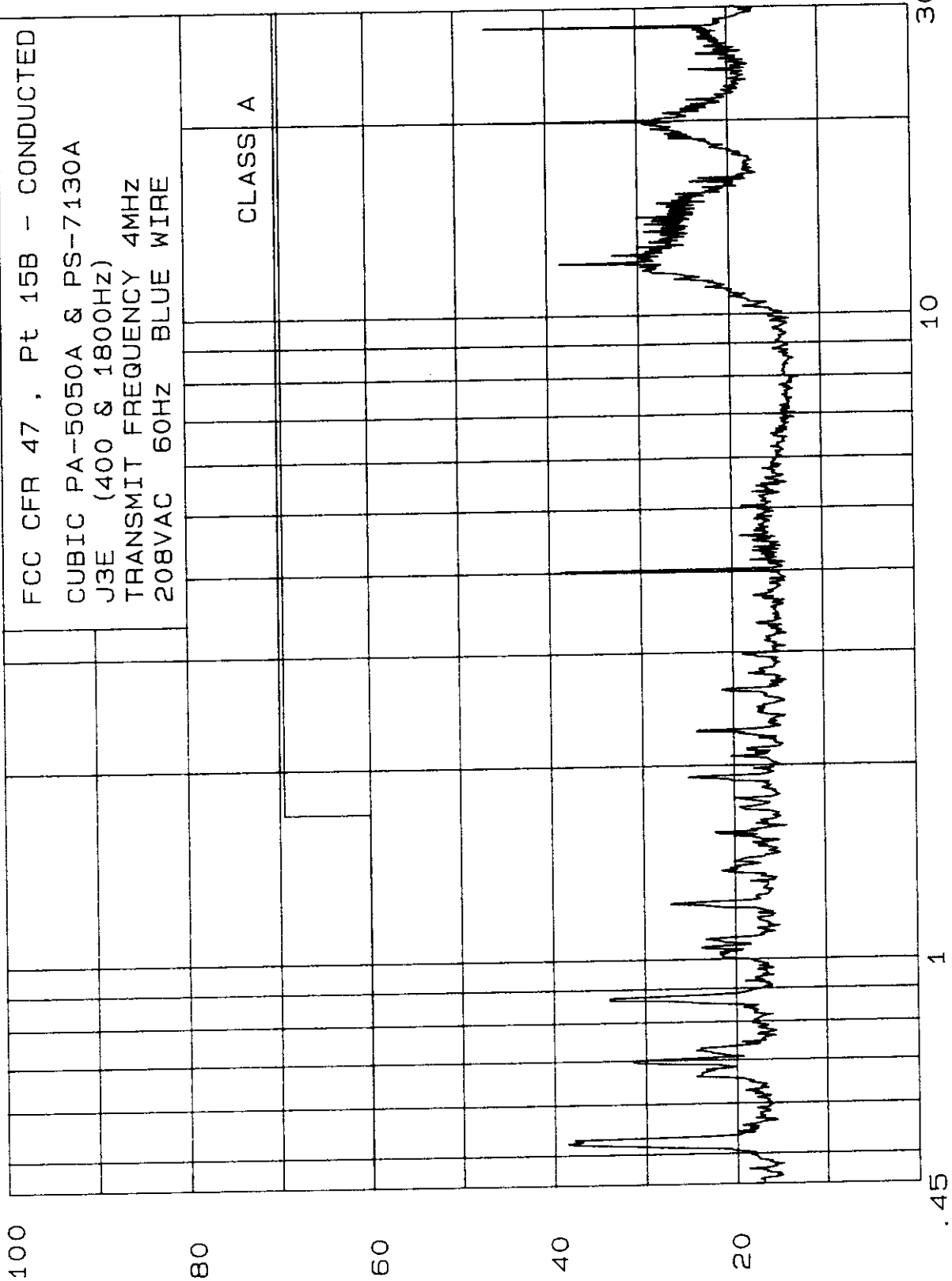


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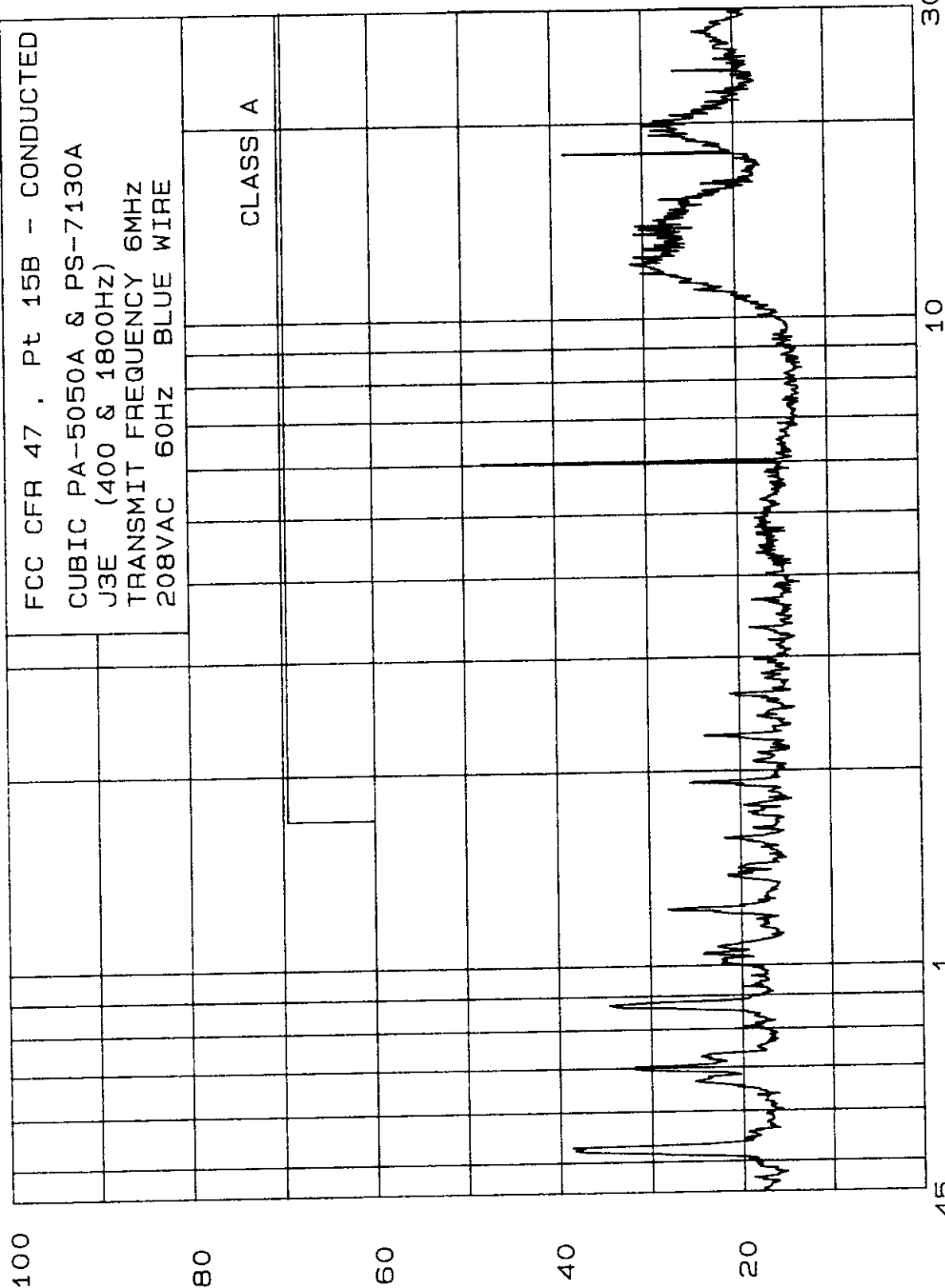


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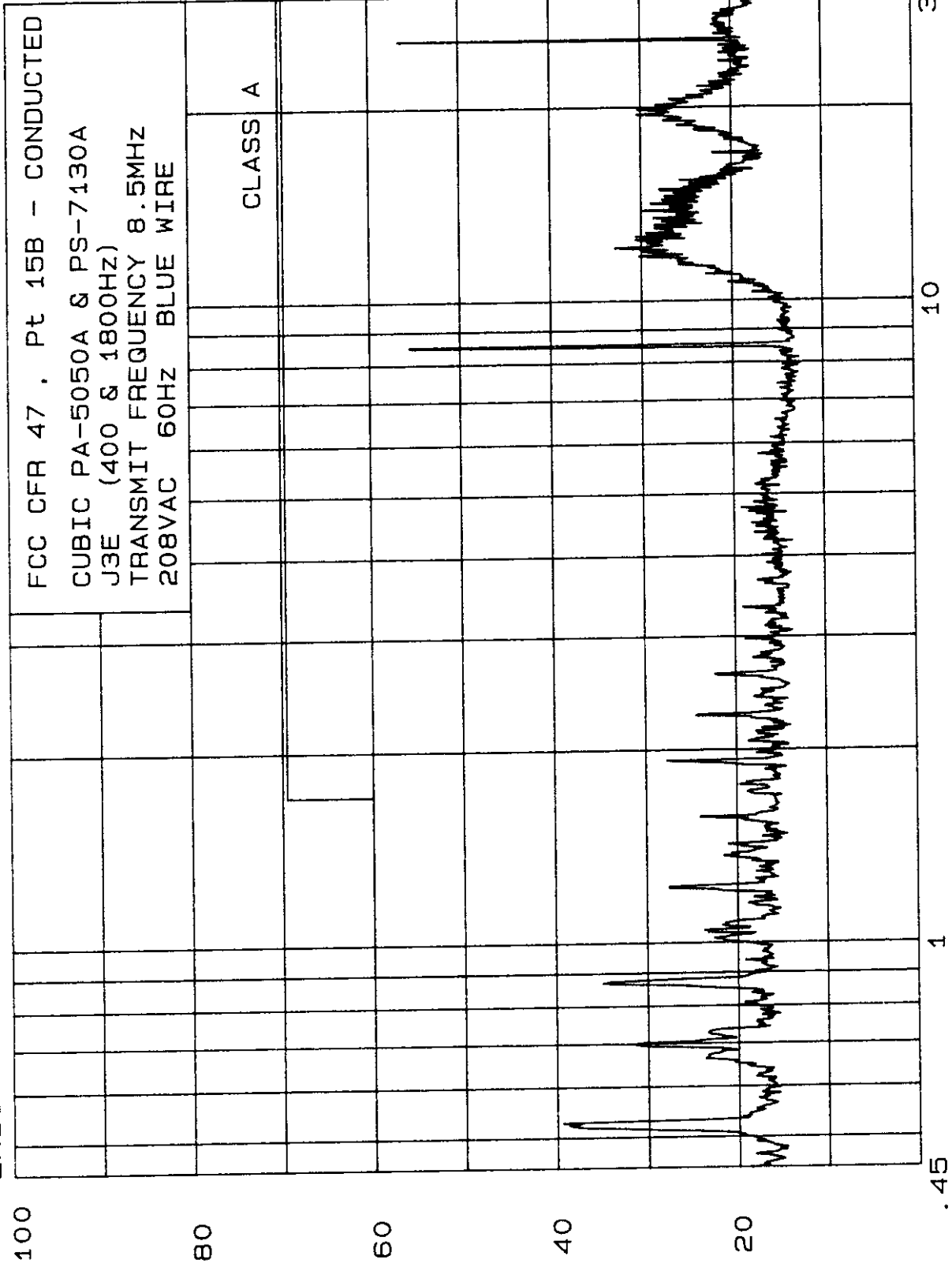
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EMISSION LEVEL [dBuV]



FCC CFR 47, Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
J3E (400 & 1800Hz)
TRANSMIT FREQUENCY 8.5MHz
208VAC 60Hz BLUE WIRE

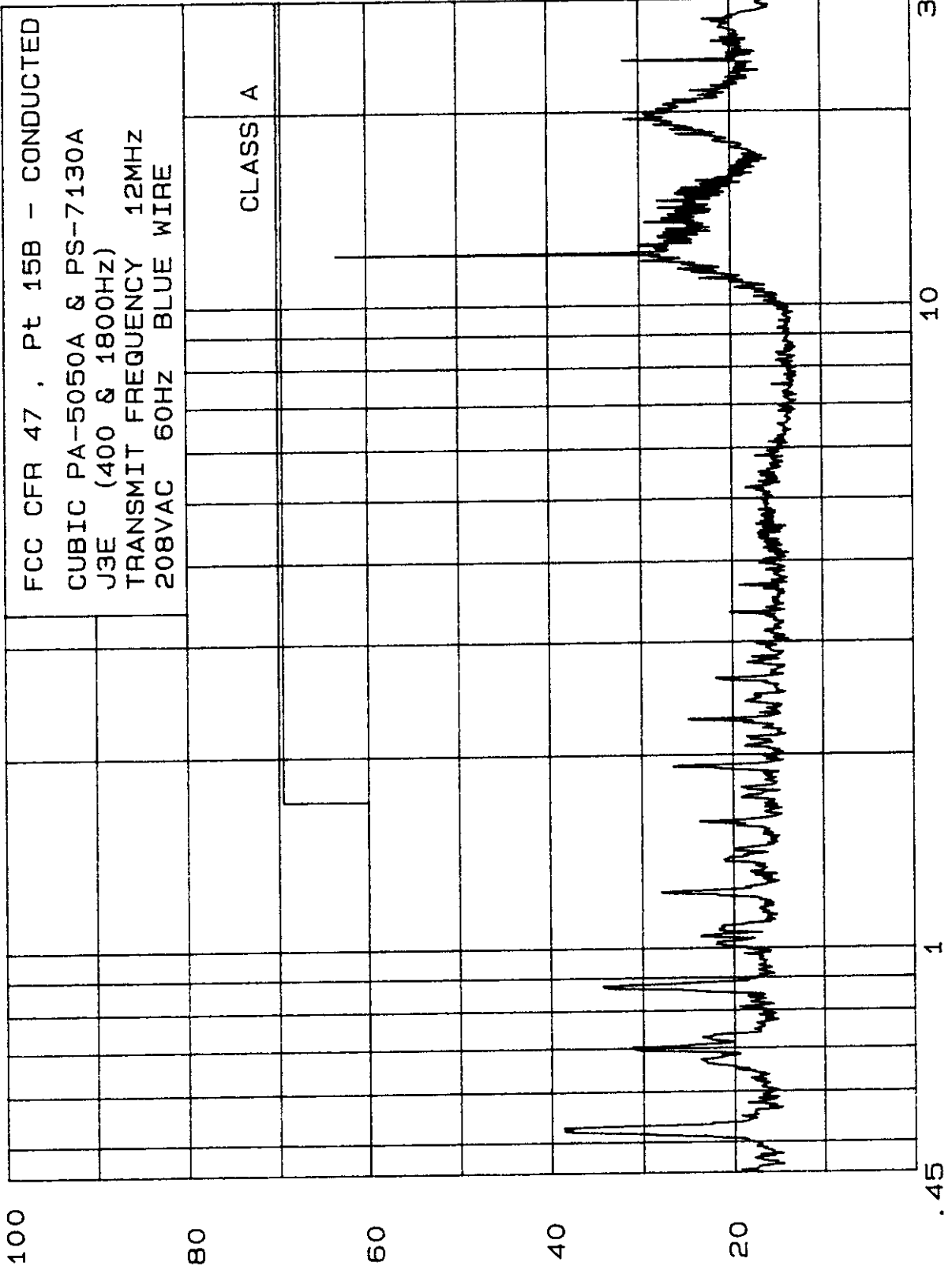
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FREQUENCY [MHz]

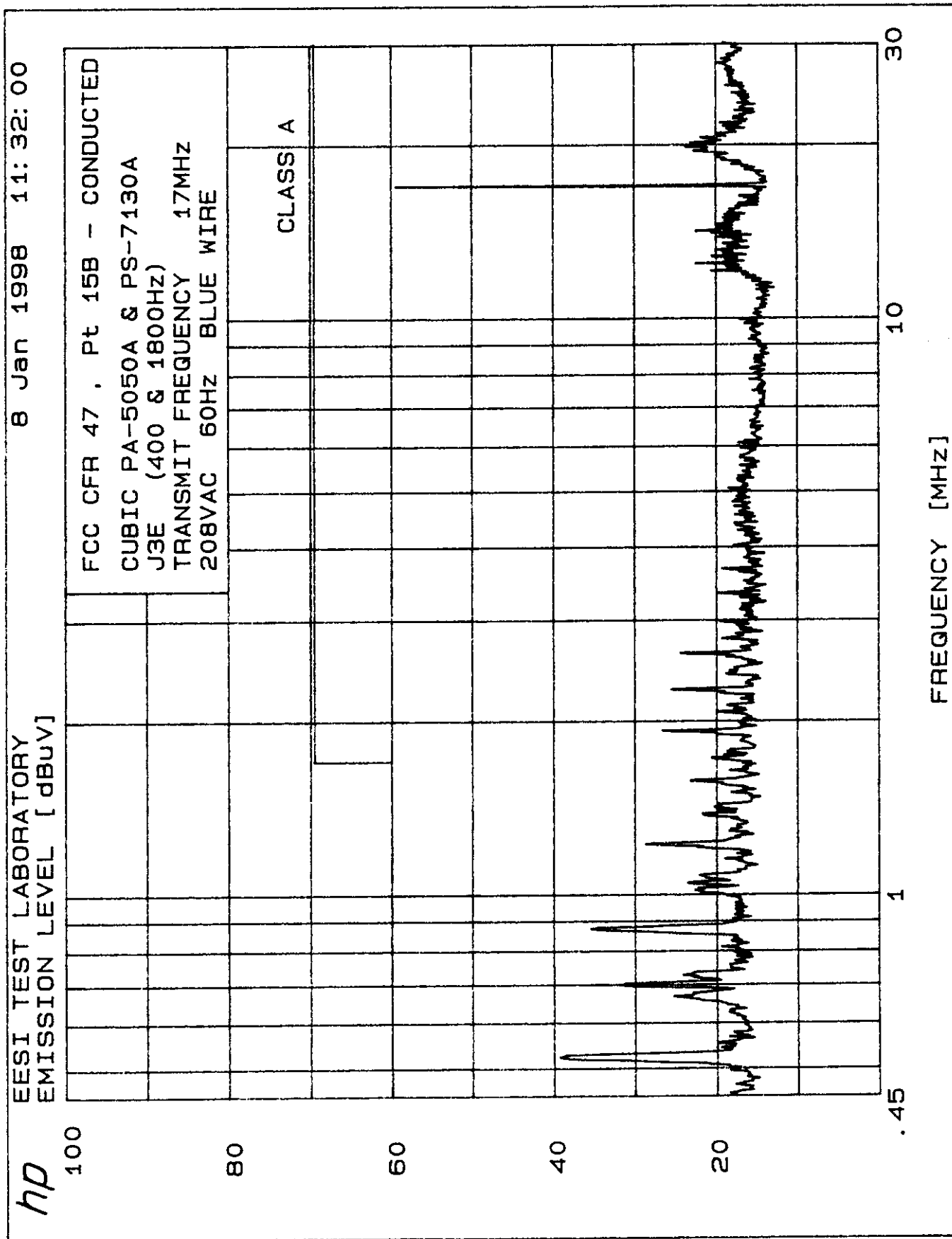
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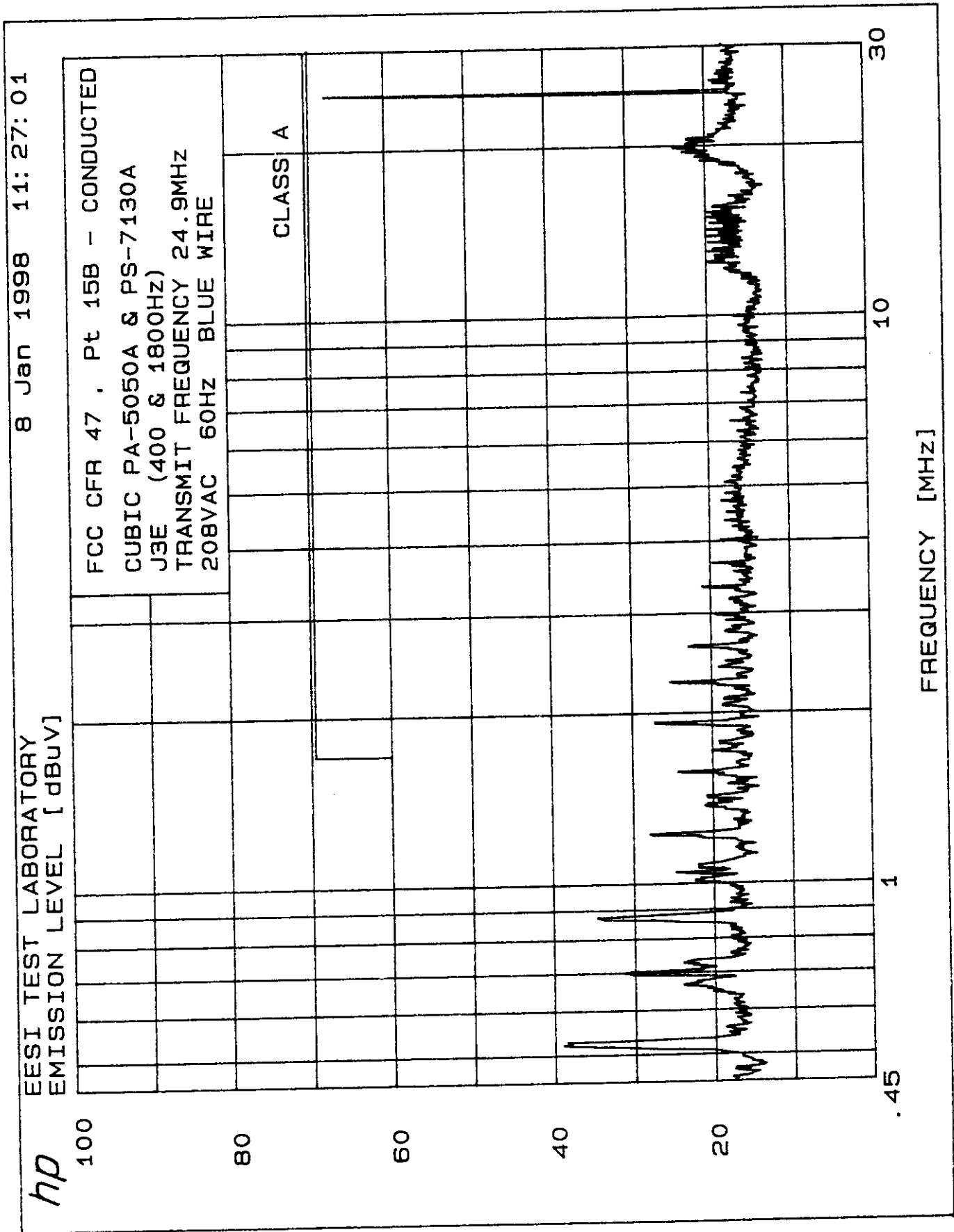
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8.2 Radiated Emissions Test Results

Electromagnetic Engineering Services, Incorporated FCC, Part 15B, Class 'A' Radiated Emissions Data Sheet (10 m Open Area Test Site)

Client: Cubic Communications
EUT: HF Exciter, Amp, Power Supply (Receive Mode)
Model #: T-4180, PA-5050A, PS-7130A

Conducted by: 
Date of Test: 2-11-98
Test Distance, Amp. gain: 10 m, 0 dB

Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for 10 m (dBuV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
144.000	9.6	v	16.1	25.7	43.5	-17.8
153.700	7.2	v	18.5	25.7	43.5	-17.8
210.740	3.8	v	16.2	20.0	43.5	-23.6
239.990	9.6	v	16.9	26.5	46.4	-19.9
288.000	9.6	v	19.9	29.5	46.4	-17.0
336.000	9.6	v	21.1	30.7	46.4	-15.8
384.000	9.1	v	22.0	31.1	46.4	-15.3
432.000	4.2	v	23.8	28.0	46.4	-18.5
528.000	10.1	v	27.0	37.1	46.4	-9.3
624.000	11.6	v	28.6	40.2	46.4	-6.3

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

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8.3 RF Power Output Test Results (\$2.985)

Electromagnetic Engineering Services, Incorporated FCC, Part 87, Sec. 2.985, Peak Output Power Data Sheet

Client: Cubic Communications
EUT: HF Exciter, Amp, Power Supply
Model #: T-4180, PA-5050A, PS-7130A

Conducted by: *C. Richard*
Date of Test: 12-10-97
Test Distance, Amp. gain: 10 m, 0 dB

Frequency (MHz)	Mode (H3E/J3E)	Spectrum Analyzer Reading* (dBm)	T-4180 1-Tone Attenuation (dB)	T-4180 2-Tone Attenuation (dB)	Power Output (Wpwp)
2.0	H3E	20.0	-13.4	-13.0	4009
2.0	J3E	19.9	-13.1	-12.8	3915
3.0	H3E	20.1	-12.9	-12.9	4103
3.0	J3E	20.1	-14.2	-14.2	4103
4.0	H3E	20.1	-14.0	-14.0	4103
4.0	J3E	20.1	-14.0	-14.0	4103
6.0	H3E	19.9	-12.5	-12.5	3915
6.0	J3E	19.9	-12.5	-12.6	3915
8.5	H3E	20.0	-15.2	-15.2	4009
8.5	J3E	20.0	-15.2	-15.2	4009
12.0	H3E	20.1	-15.4	-15.4	4103
12.0	J3E	20.0	-15.4	-15.4	4009
17.0	H3E	20.1	-14.1	-14.1	4103
17.0	J3E	20.0	-14.1	-14.1	4009
25.0	H3E	20.1	-13.4	-13.4	4103
25.0	J3E	20.1	-13.4	-13.4	4103

* Power (measured in dBm) after 40dB attenuation via a directional coupler

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8.4 Modulation Characteristics Test Results (§2.987)

Electromagnetic Engineering Services, Incorporated FCC, Part 87, Sec. 2.987, Peak Output Power for Input Voltage Data Sheet

Client: Cubic Communications

EUT: HF Exciter, Amp, Power Supply

Model #: T-4180, PA-5050A, PS-7130A

(Line Input, H3E Mode, 1500Hz Mod.)

Conducted by: *C. Richard*

Date of Test: 12-12-97

Test Distance, Amp. gain: 10 m, 0 dB

Input Voltage (Vpep)	Input (dBm)	2MHz Output (Wpep)	3 MHz Output (Wpep)	4 MHz Output (Wpep)	6 MHz Output (Wpep)
2.00000	10.0	1117	1211	1156	1239
0.63000	0.0*	1130	1211	1156	1239
0.20000	-10.0	1117	1211	1156	1239
0.06300	-20.0	549	592	565	618
0.02000	-30.0	358	385	366	397
0.00630	-40.0	305	327	312	336
0.00200	-50.0	290	310	296	318
0.00063	-60.0	284	305	291	312
0.00020	-70.0	283	303	290	311

Input Voltage (Vpep)	Input (dBm)	8.5 MHz Output (Wpep)	12 MHz Output (Wpep)	17 MHz Output (Wpep)	24.5 MHz Output (Wpep)
2.00000	10.0	1104.0	1007.0	1019.0	1104.0
0.63000	0.0	1104.0	1007.0	1007.0	1104.0
0.20000	-10.0	1104.0	996.0	1007.0	1104.0
0.06300	-20.0	536.0	486.0	502.0	547.0
0.02000	-30.0	351.0	318.0	323.0	352.0
0.00630	-40.0	298.0	272.0	273.0	298.0
0.00200	-50.0	283.0	258.0	258.0	293.0
0.00063	-60.0	278.0	254.0	254.0	278.0
0.00020	-70.0	277.0	252.0	252.0	277.0

* -30dBm is nominal input level. At this level, carrier=modulation power. All readings below 0dBm input are of the modulation power (carrier stays the same).

** Readings are sideband power pep (Peak Envelope Power).

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Electromagnetic Engineering Services, Incorporated
FCC, Part 87, Sec. 2.987, Peak Output Power for Input Voltage Data Sheet

Client: Cubic Communications

EUT: HF Exciter, Amp, Power Supply

Model #: T-4180, PA-5050A, PS-7130A

(Microphone Input, H3E Mode, 1500Hz Mod.)

Conducted by: *C. Fink*

Date of Test: 12-12-97

Test Distance, Amp. gain: 10 m, 0 dB

Input Voltage (Vpep)	Input (dBm)	2MHz Output (Wpep)	3 MHz Output (Wpep)	4 MHz Output (Wpep)	6 MHz Output (Wpep)
40.0000	-24.0	996.0	984.0	984.0	1007.0
20.0000	-30.0	1007.0	984.0	984.0	1007.0
6.3000	-40.0	984.0	984.0	984.0	984.0
2.0000	-50.0	931.0	930.0	909.0	872.0
0.6300	-60.0	425.0	429.0	411.0	412.0
0.2000	-70.0	300.0	296.0	295.0	297.0
0.0630	-80.0	268.0	261.0	259.0	266.0
0.0200	-90.0	257.0	251.0	250.0	256.0
0.0063	-100.0	254.0	248.0	247.0	253.0

Input Voltage (Vpep)	Input (dBm)	8.5 MHz Output (Wpep)	12 MHz Output (Wpep)	17 MHz Output (Wpep)	24.5 MHz Output (Wpep)
40.0000	-24.0	984.0	1031.0	1007.0	1007.0
20.0000	-30.0	984.0	1031.0	1007.0	1019.0
6.3000	-40.0	951.0	1007.0	1007.0	996.0
2.0000	-50.0	852.0	963.0	962.0	952.0
0.6300	-60.0	394.0	441.0	446.0	429.0
0.2000	-70.0	291.0	311.0	309.0	303.0
0.0630	-80.0	260.0	274.0	270.0	269.0
0.0200	-90.0	250.0	263.0	258.0	257.0
0.0063	-100.0	248.0	259.0	253.0	253.0

-30dBm is nominal input level. At this level, carrier=modulation power. All readings below -30dBm input are of the modulation power (carrier stays the same).

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Electromagnetic Engineering Services, Incorporated
FCC, Part 87, Sec. 2.987, Peak Output Power for Input Voltage Data Sheet

Client: Cubic Communications

Conducted by: 

EUT: HF Exciter, Amp, Power Supply

Date of Test: 12-12-97

Model #: T-4180, PA-5050A, PS-7130A

Test Distance, Amp. gain: 10 m, 0 dB

(Line Input, J3E Mode, 400 & 1800Hz Mod.)

Input Voltage (Vpep)	Input (dBm)	2MHz Output (Wpep)	3 MHz Output (Wpep)	4 MHz Output (Wpep)	6 MHz Output (Wpep)
2.00000	10.0	4296.0	4499.0	4820.0	5048.0
0.63000	0.0*	4296.0	4499.0	4820.0	5048.0
0.20000	-10.0	4198.0	4396.0	4820.0	5048.0
0.06300	-20.0	2321.0	2530.0	2774.0	3185.0
0.02000	-30.0	136.0	160.0	149.0	206.0
0.00630	-40.0	8.4	10.1	9.0	12.7
0.00200	-50.0	0.8	1.0	0.8	1.3
0.00063	-60.0	0.1	0.1	0.1	0.1

Input Voltage (Vpep)	Input (dBm)	8.5 MHz Output (Wpep)	12 MHz Output (Wpep)	17 MHz Output (Wpep)	24.5 MHz Output (Wpep)
2.00000	10.0	4396.0	4103.0	5165.0	4711.0
0.63000	0.0	4396.0	4103.0	5165.0	4711.0
0.20000	-10.0	4296.0	4103.0	5165.0	4711.0
0.06300	-20.0	2416.0	2307.0	3657.0	2972.0
0.02000	-30.0	149.0	149.0	242.0	206.0
0.00630	-40.0	10.1	10.1	17.1	14.6
0.00200	-50.0	0.9	1.0	1.7	1.3
0.00063	-60.0	0.1	0.1	0.2	0.1

* 0dBm is nominal input level.

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Electromagnetic Engineering Services, Incorporated
FCC, Part 87, Sec. 2.987, Peak Output Power for Input Voltage Data Sheet

Client: Cubic Communications

Conducted by: *C. Perkin*

EUT: HF Exciter, Amp, Power Supply

Date of Test: 12-12-97

Model #: T-4180, PA-5050A, PS-7130A

Test Distance, Amp. gain: 10 m, 0 dB

(Microphone Input, J3E Mode, 400 & 1800Hz Mod.)

Input Voltage (Vpep)	Input (dBm)	2MHz Output (Wpep)	4 MHz Output (Wpep)	6 MHz Output (Wpep)	8.5 MHz Output (Wpep)
2.00000	-24.0	5664.0	5664.0	5664.0	5535.0
0.63000	-30.0	4499.0	4604.0	4820.0	4396.0
0.20000	-40.0	4499.0	4604.0	4604.0	4396.0
0.06300	-50.0	4198.0	4604.0	4604.0	4296.0
0.02000	-60.0	1560.0	1596.0	1750.0	1524.0
0.00630	-70.0	85.7	85.7	96.2	89.8
0.00200	-80.0	5.8	6.4	7.3	10.1
0.00063	-90.0	0.6	0.6	0.9	1.0
0.00020	-100.0	0.1	0.1	0.1	0.1

Input Voltage (Vpep)	Input (dBm)	12 MHz Output (Wpep)	17 MHz Output (Wpep)	24.5 MHz Output (Wpep)
2.00000	-24.0	5409.0	5795.0	5048.0
0.63000	-30.0	4296.0	5165.0	4103.0
0.20000	-40.0	4198.0	5165.0	4103.0
0.06300	-50.0	4009.0	5048.0	4103.0
0.02000	-60.0	1390.0	2255.0	1524.0
0.00630	-70.0	85.7	149.0	100.7
0.00200	-80.0	6.4	10.1	7.3
0.00063	-90.0	0.8	0.9	0.6
0.00020	-100.0	0.1	0.1	0.1

-30dBm is nominal input level.

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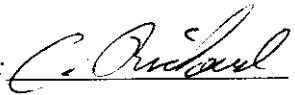
Electromagnetic Engineering Services, Incorporated
FCC, Part 87, Sec. 2.987, Peak Output Power for Input Voltage Data Sheet

Client: Cubic Communications

EUT: HF Exciter, Amp, Power Supply

Model #: T-4180, PA-5050A, PS-7130A

(Microphone Input, H3E Mode, 1500Hz Mod.)

Conducted by: 

Date of Test: 12-12-97

Test Distance, Amp. gain: 10 m, 0 dB

Input Voltage (V _{pep})	Input (dBm)	2MHz Output (W _{pep})	3 MHz Output (W _{pep})	4 MHz Output (W _{pep})	6 MHz Output (W _{pep})
40.0000	-24.0	1117	1211	1156	1239
20.0000	-30.0	1130	1211	1156	1239
6.3000	-40.0	1117	1211	1156	1239
2.0000	-50.0	549	592	565	618
0.6300	-60.0	358	385	366	397
0.2000	-70.0	305	327	312	336
0.0630	-80.0	290	310	296	318
0.0200	-90.0	284	305	291	312
0.0063	-100.0	283	303	290	311

Input Voltage (V _{pep})	Input (dBm)	8.5 MHz Output (W _{pep})	12 MHz Output (W _{pep})	17 MHz Output (W _{pep})	24.5 MHz Output (W _{pep})
40.0000	-24.0	117.0	1007.0	1019.0	117.0
20.0000	-30.0	117.0	1007.0	1007.0	117.0
6.3000	-40.0	117.0	996.0	1007.0	117.0
2.0000	-50.0	536.0	486.0	502.0	547.0
0.6300	-60.0	351.0	318.0	323.0	352.0
0.2000	-70.0	298.0	272.0	273.0	298.0
0.0630	-80.0	283.0	258.0	258.0	283.0
0.0200	-90.0	278.0	254.0	254.0	305.0
0.0063	-100.0	277.0	252.0	252.0	303.0

-0dBm is nominal input level. At this level, carrier=modulation power. All readings below -30dBm input are of the modulation power (carrier stays the same).

Readings are sideband power pep (Peak Envelope Power)

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Electromagnetic Engineering Services, Incorporated
FCC, Part 87, Sec. 2.987, Peak Output Power for Input Voltage Data Sheet

Client: Cubic Communications

EUT: HF Exciter, Amp, Power Supply

Model #: T-4180, PA-5050A, PS-7130A

(Line Input, J3E Mode, 400 & 1800Hz Mod.)

Conducted by: *C. Richard*

Date of Test: 12-12-97

Test Distance, Amp. gain: 10 m, 0 dB

Input Voltage (Vpep)	Input (dBm)	2MHz Output (Wpep)	3 MHz Output (Wpep)	4 MHz Output (Wpep)	6 MHz Output (Wpep)
2.00000	10.0	4296.0	4499.0	4820.0	5048.0
0.63000	0.0*	4296.0	4499.0	4820.0	5048.0
0.20000	-10.0	4198.0	4396.0	4820.0	5048.0
0.06300	-20.0	2321.0	2530.0	2774.0	3185.0
0.02000	-30.0	136.0	160.0	149.0	206.0
0.00630	-40.0	8.4	10.1	9.0	12.7
0.00200	-50.0	0.8	1.0	0.8	1.3
0.00063	-60.0	0.1	0.1	0.1	0.1

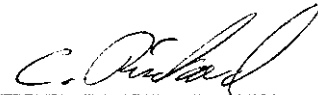
Input Voltage (Vpep)	Input (dBm)	8.5 MHz Output (Wpep)	12 MHz Output (Wpep)	17 MHz Output (Wpep)	24.5 MHz Output (Wpep)
2.00000	10.0	4396.0	4103.0	5165.0	4711.0
0.63000	0.0	4396.0	4103.0	5165.0	4711.0
0.20000	-10.0	4296.0	4103.0	5165.0	4711.0
0.06300	-20.0	2416.0	2307.0	3657.0	2972.0
0.02000	-30.0	149.0	149.0	242.0	206.0
0.00630	-40.0	10.1	10.1	17.1	14.6
0.00200	-50.0	0.9	1.0	1.7	1.3
0.00063	-60.0	0.1	0.1	0.2	0.1

* 0dBm is nominal input level.

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Electromagnetic Engineering Services, Incorporated
FCC, Part 87, Sec. 2.987, Peak Output Power for Input Voltage Data Sheet

Client: Cubic Communications

Conducted by: 

EUT: HF Exciter, Amp, Power Supply

Date of Test: 12-12-97

Model #: T-4180, PA-5050A, PS-7130A

Test Distance, Amp. gain: 10 m, 0 dB

(Microphone Input, J3E Mode, 400 & 1800Hz Mod.)

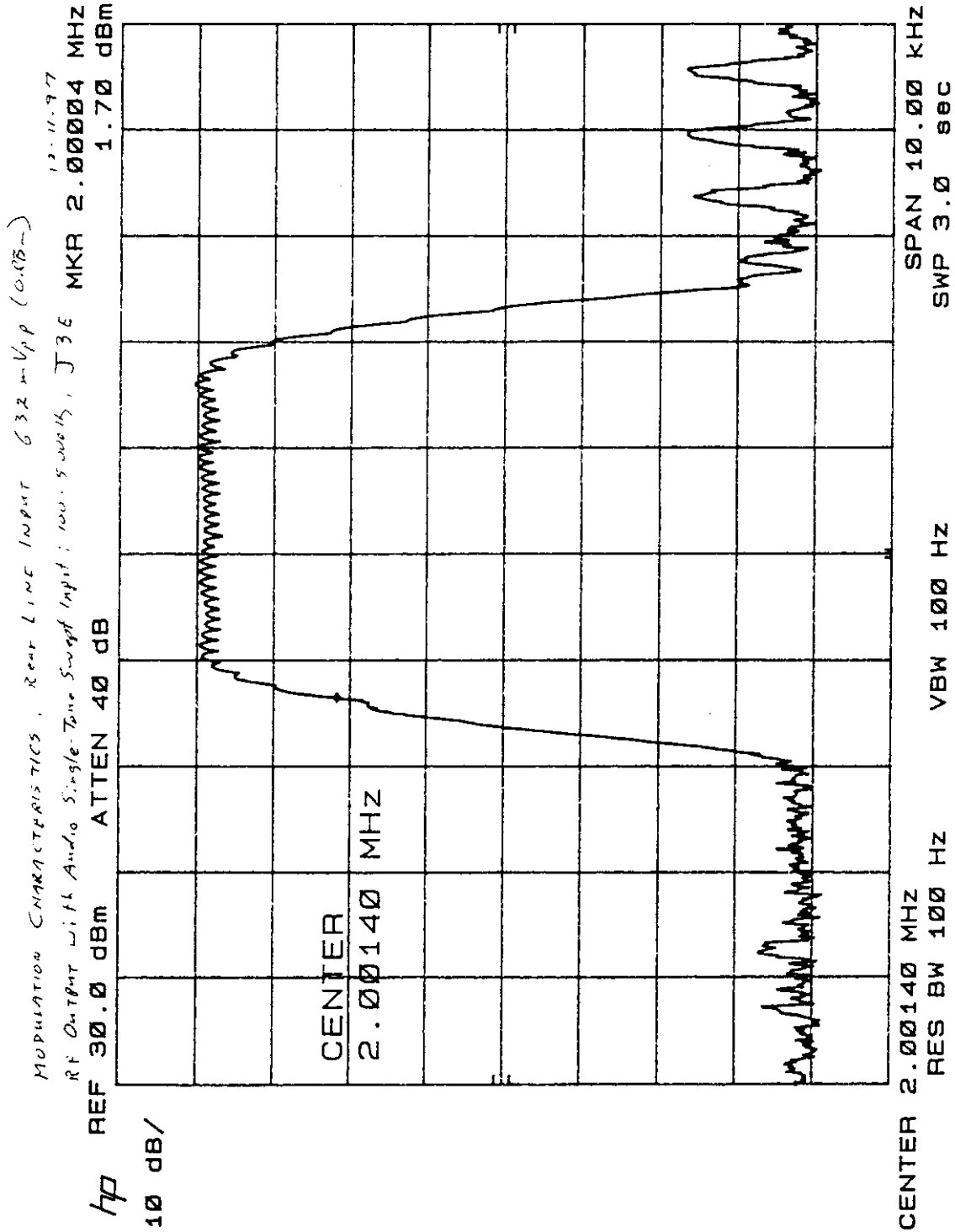
Input Voltage (Vpep)	Input (dBm)	2MHz Output (Wpep)	4 MHz Output (Wpep)	6 MHz Output (Wpep)	8.5 MHz Output (Wpep)
2.00000	-24.0	5664.0	5664.0	5664.0	5535.0
0.63000	-30.0	4499.0	4604.0	4820.0	4396.0
0.20000	-40.0	4499.0	4604.0	4604.0	4396.0
0.06300	-50.0	4198.0	4604.0	4604.0	4296.0
0.02000	-60.0	1560.0	1596.0	1750.0	1524.0
0.00630	-70.0	85.7	85.7	96.2	89.8
0.00200	-80.0	5.8	6.4	7.3	10.1
0.00063	-90.0	0.6	0.6	0.9	1.0
0.00020	-100.0	0.1	0.1	0.1	0.1

Input Voltage (Vpep)	Input (dBm)	12 MHz Output (Wpep)	17 MHz Output (Wpep)	24.5 MHz Output (Wpep)
2.00000	-24.0	5409.0	5795.0	5048.0
0.63000	-30.0	4296.0	5165.0	4103.0
0.20000	-40.0	4198.0	5165.0	4103.0
0.06300	-50.0	4009.0	5048.0	4103.0
0.02000	-60.0	1390.0	2255.0	1524.0
0.00630	-70.0	85.7	149.0	100.7
0.00200	-80.0	6.4	10.1	7.3
0.00063	-90.0	0.8	0.9	0.6
0.00020	-100.0	0.1	0.1	0.1

-30dBm is nominal input level.

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J3E at 2MHz



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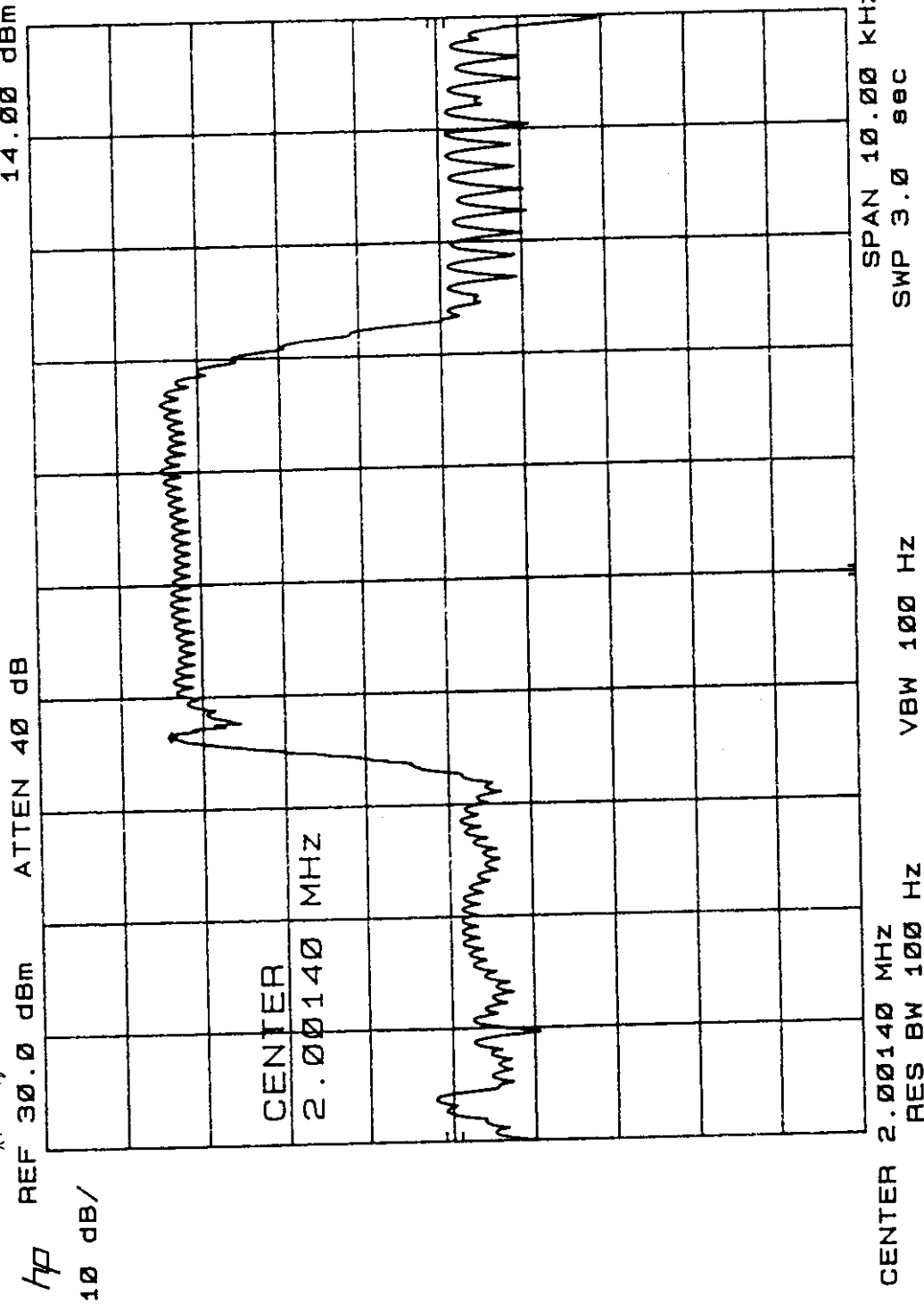
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H3E @ 2 MHz

MODULATION CHARACTERISTICS, REAR PANEL LINE INPUT 632mVpp (cont'd)
12-11-97

RF output with Audio Single-Tone Sweep Input: 100-5000Hz, H3E

MKR 2.00004 MHz
14.00 dBm



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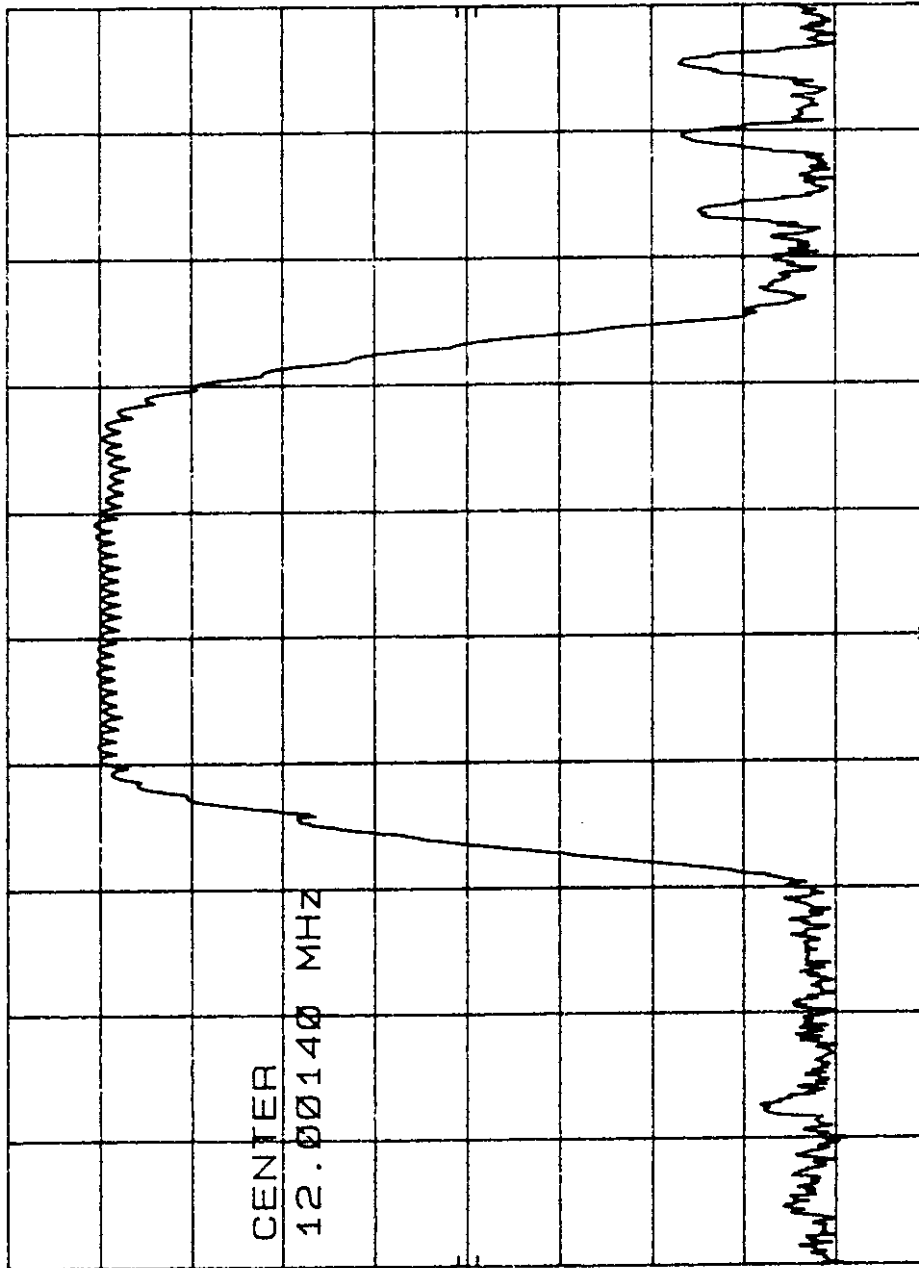
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53E @ 12 MHz

MODULATION CHARACTERISTICS, Raw Line Input: 532 mV p-p (0 dBm)
RF Output with Audio Single-Tone Input: 100 Hz - 5 kHz 53E 12.11.97
(100 Hz 54 dB)

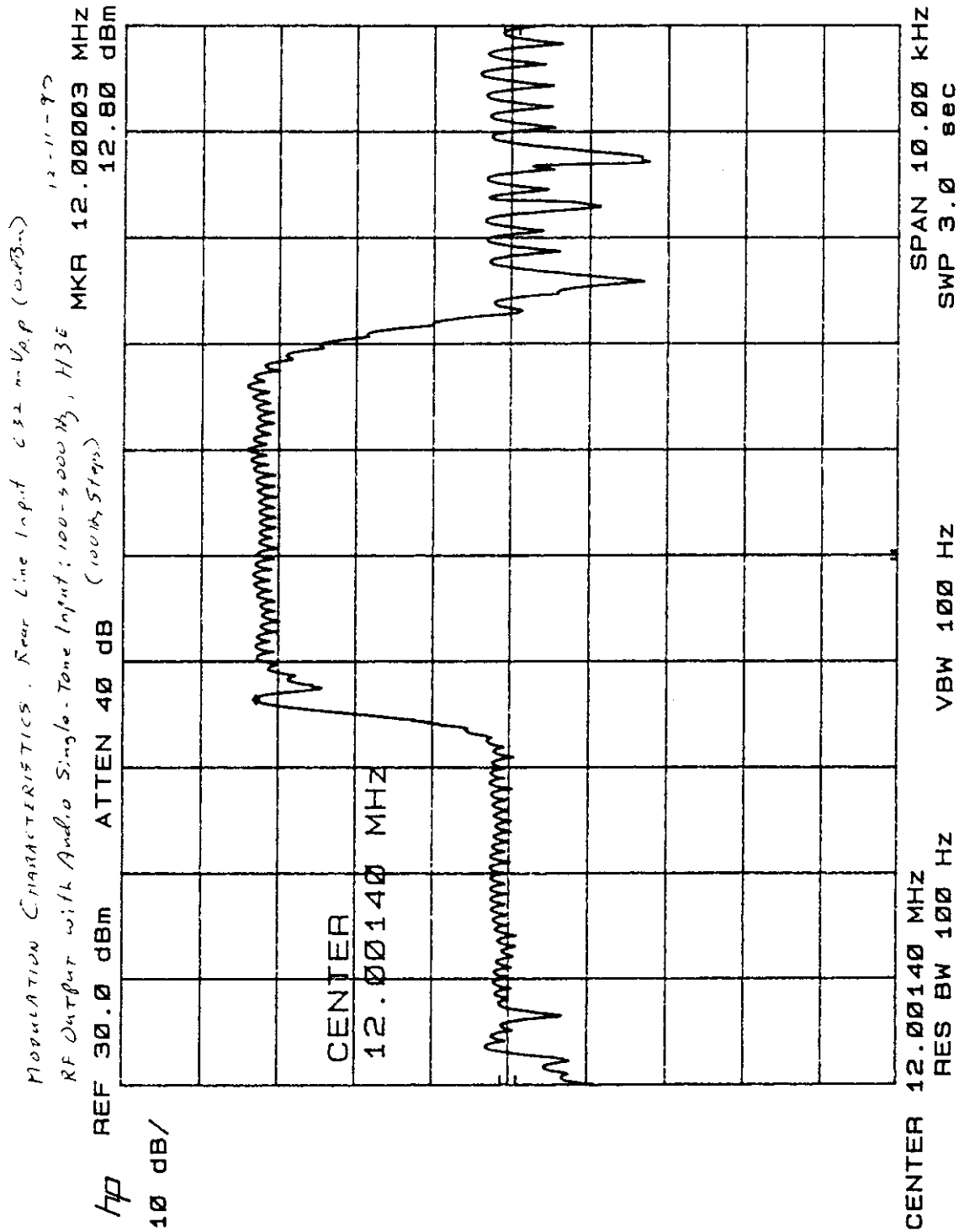
hp REF 30.0 dBm ATTN 40 dB

10 dB/



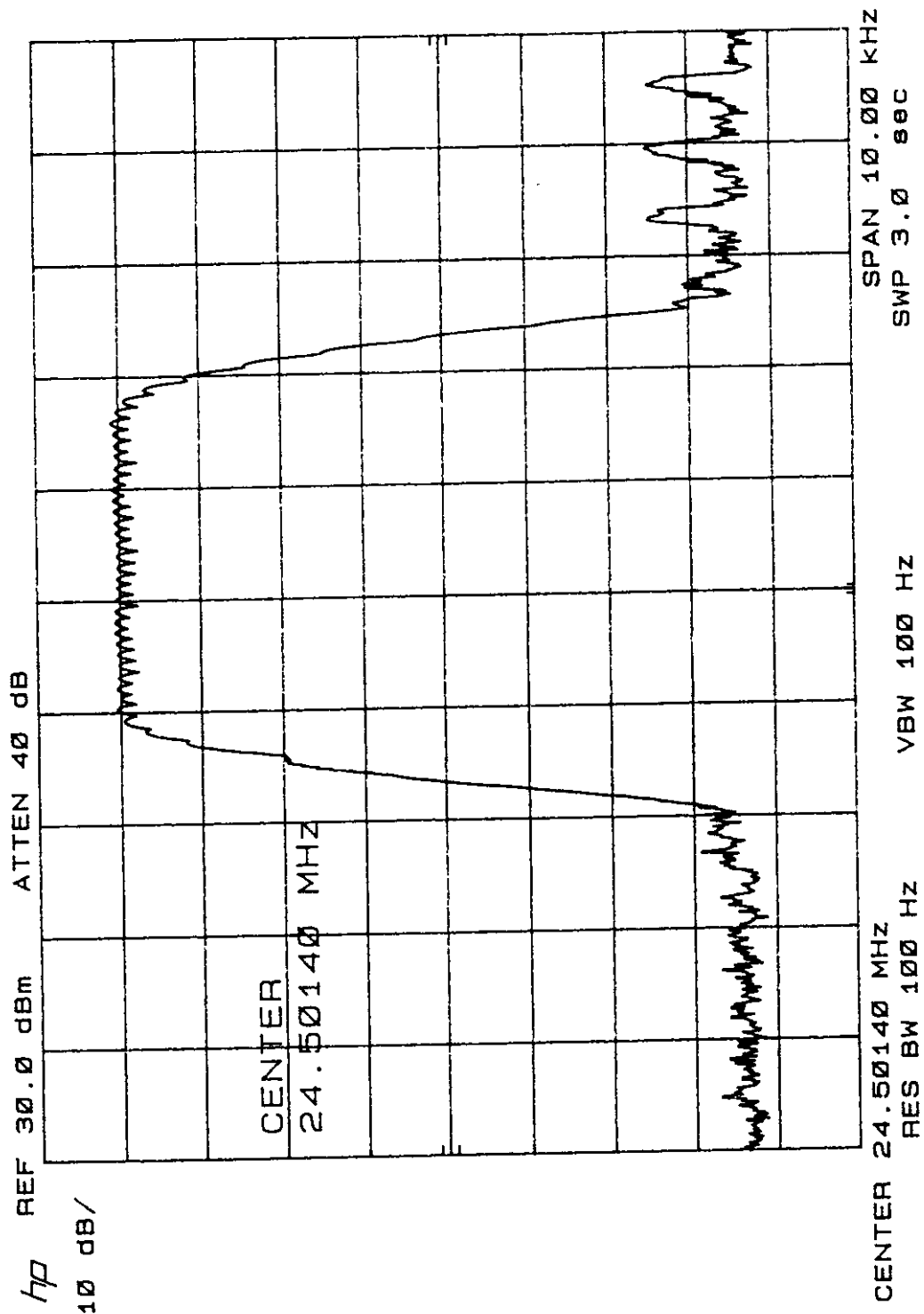
CENTER 12.00140 MHZ RES BW 100 Hz VBW 100 Hz SPAN 10.00 KHZ SWP 3.0 sec

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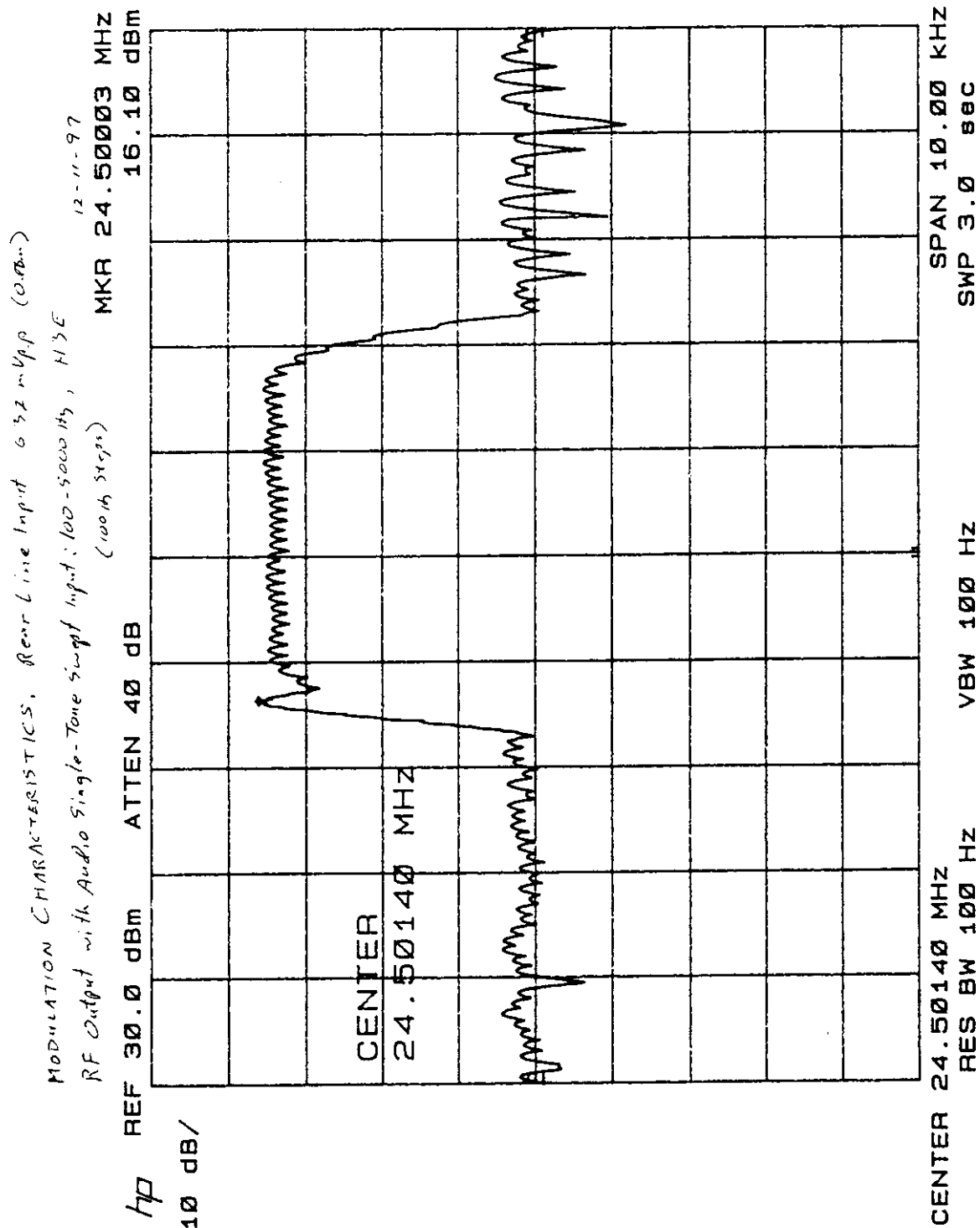


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MODULATION CHARACTERISTICS. Rear LINE INPUT 632mV_{p-p} (0.00m)
RF Output with Audio Single-Tone swept input: 100-5000Hz, J3E
(100Hz steps)
12-11-97



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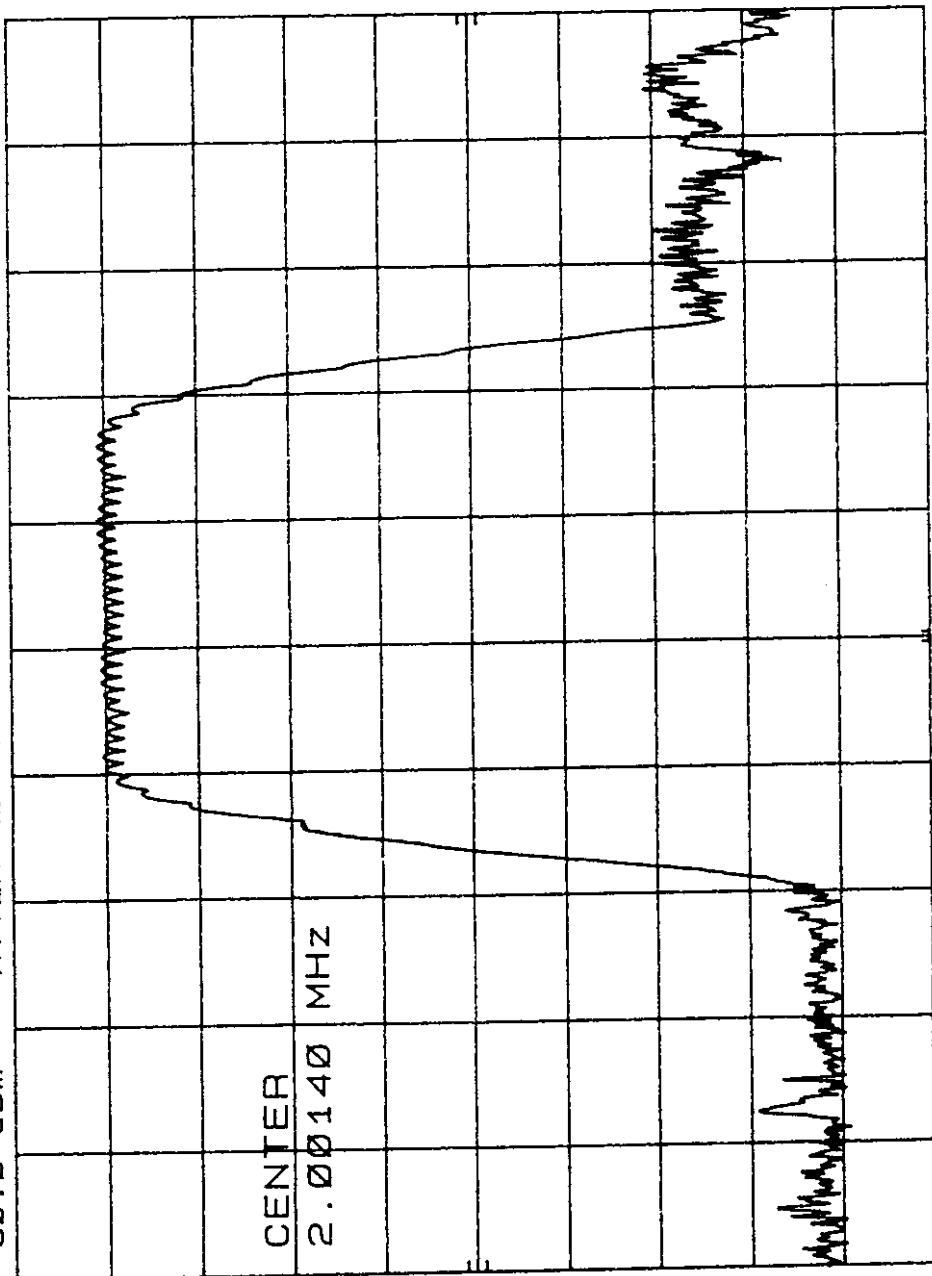
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MODULATION CHARACTERISTICS, Microphone Input 50.6 mVpp
RF OUTPUT WITH AUDIO SINGLE-TONE SWEEP INPUT: 100-5000 Hz, J3E
12-11-97

hp REF 30.0 dBm ATTEN 40 dB

hp

10 dB/



SWP 3.0 sec

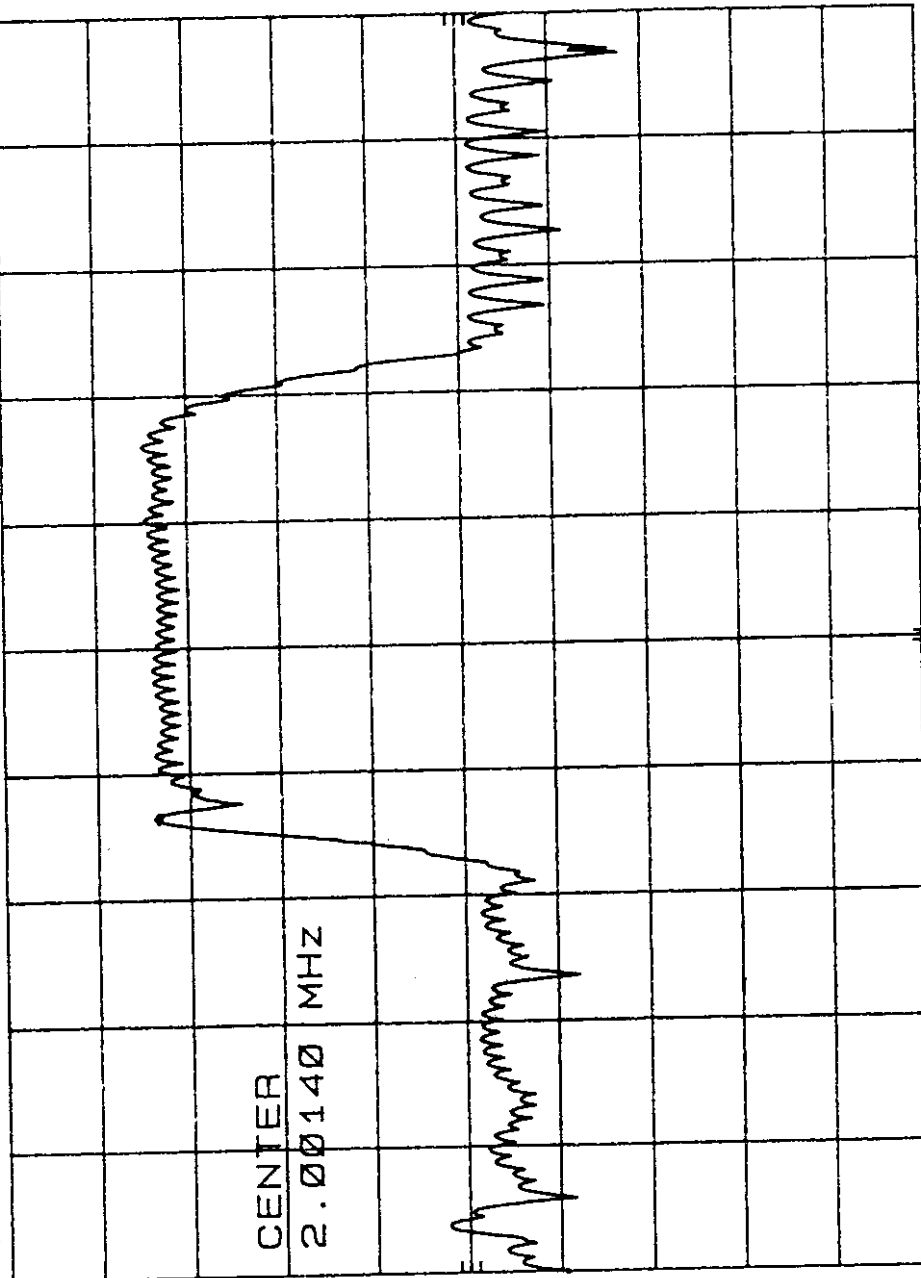
VBW 100 Hz

CENTER 2.00140 MHz
RES BW 100 Hz

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H3E w/ 210/17

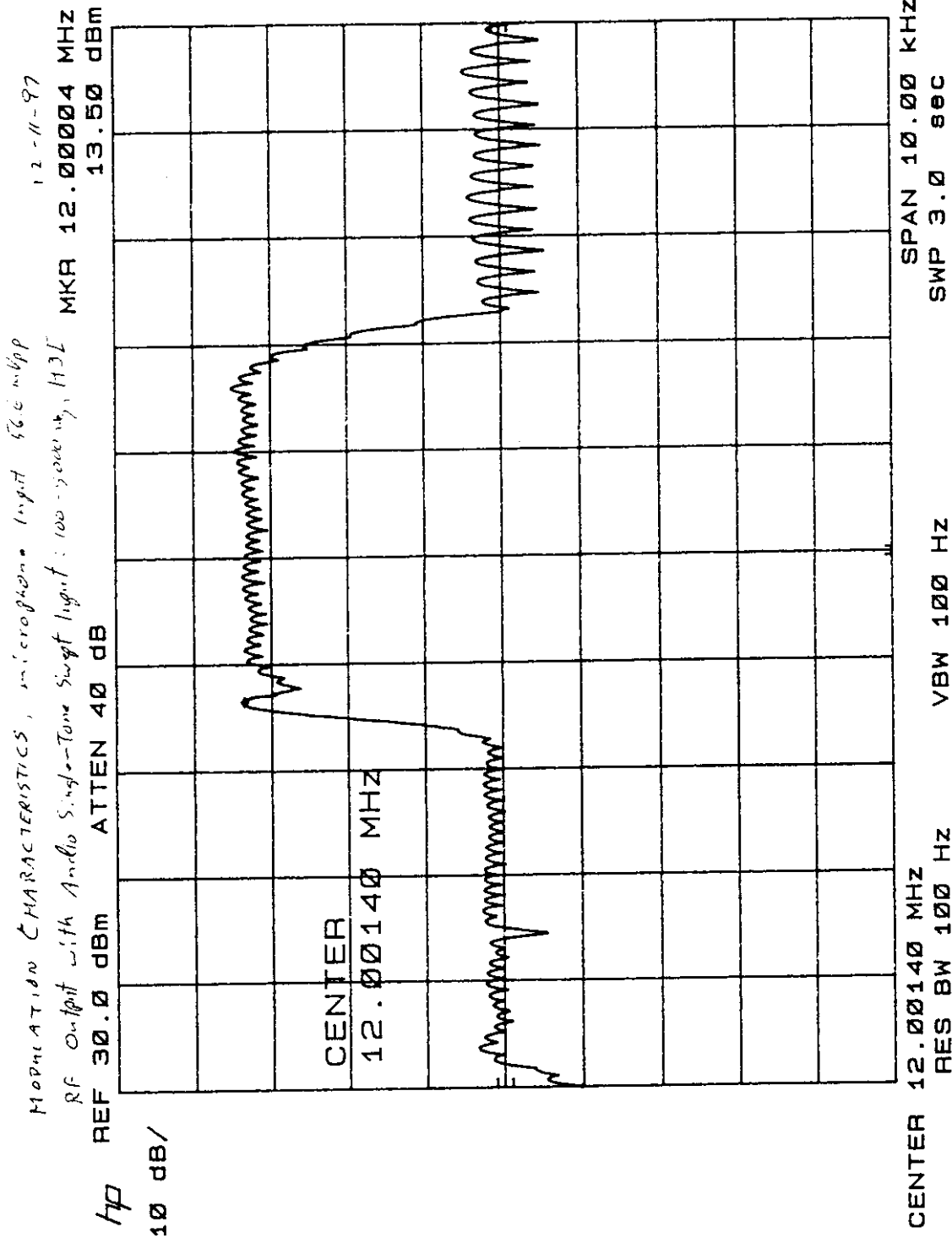
MODULATION CHARACTERISTICS, MICROPHONE INPUT 56.3 mVpp
 RF OUTPUT WITH Audio Single-Tone Swept Input: 100-5000 Hz, H3E MKR 2.00004 MHz
 13.50 dBm
 70 REF 30.0 dBm ATTN 40 dB
 10 dB/



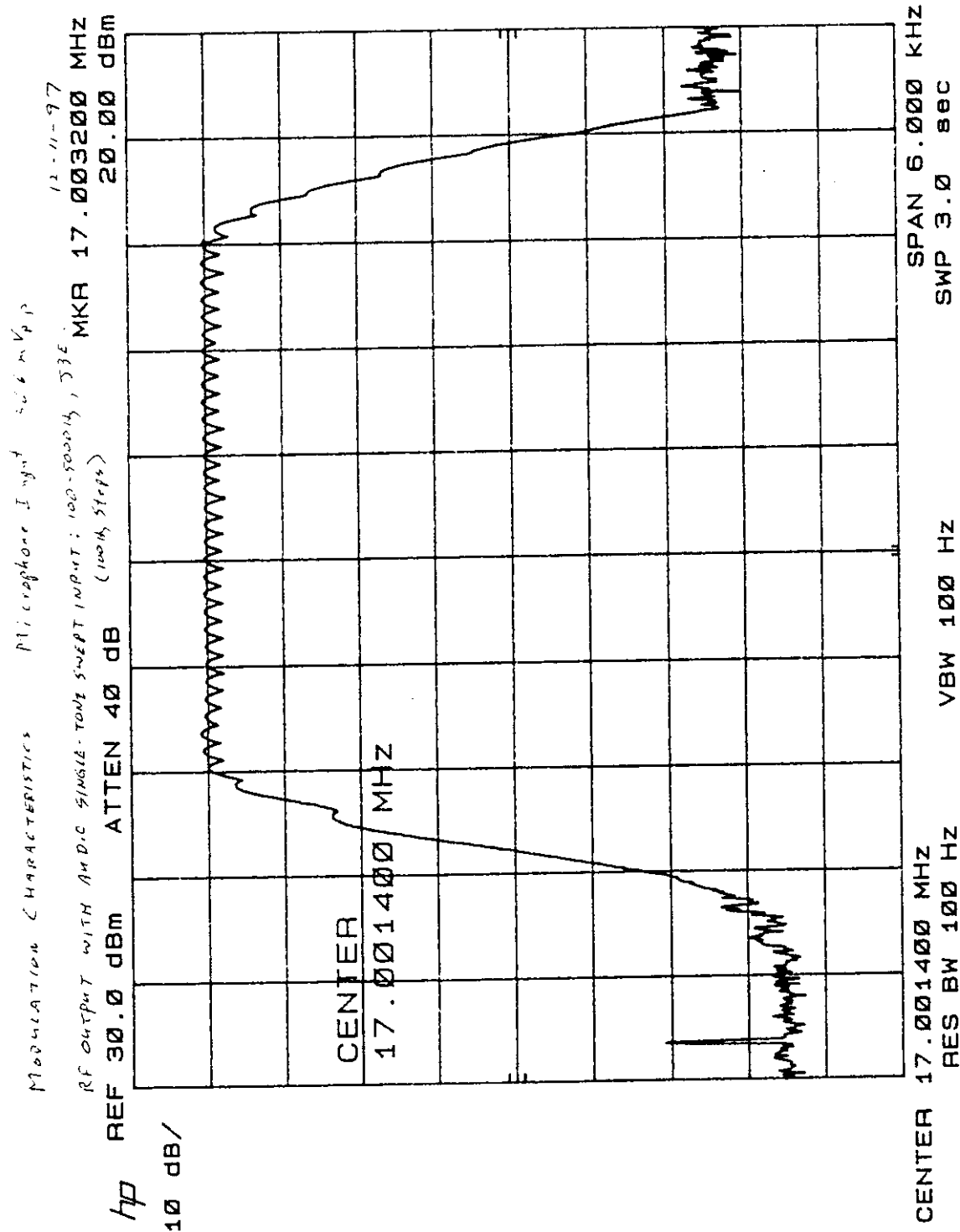
CENTER 2.00140 MHz
 RES BW 100 Hz
 VBW 100 Hz
 SWP 3.0 sec

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H 3E at 12 MHz



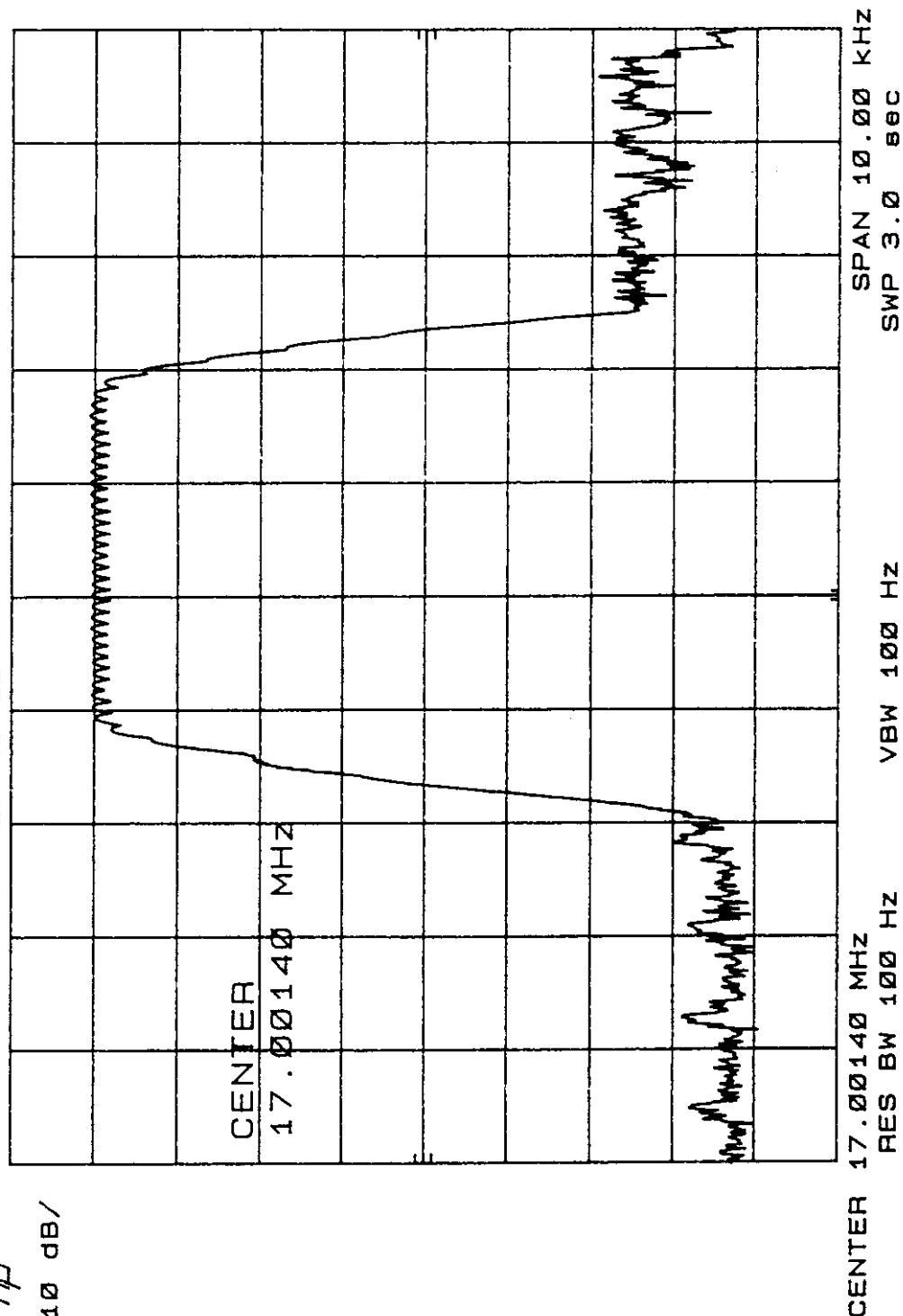
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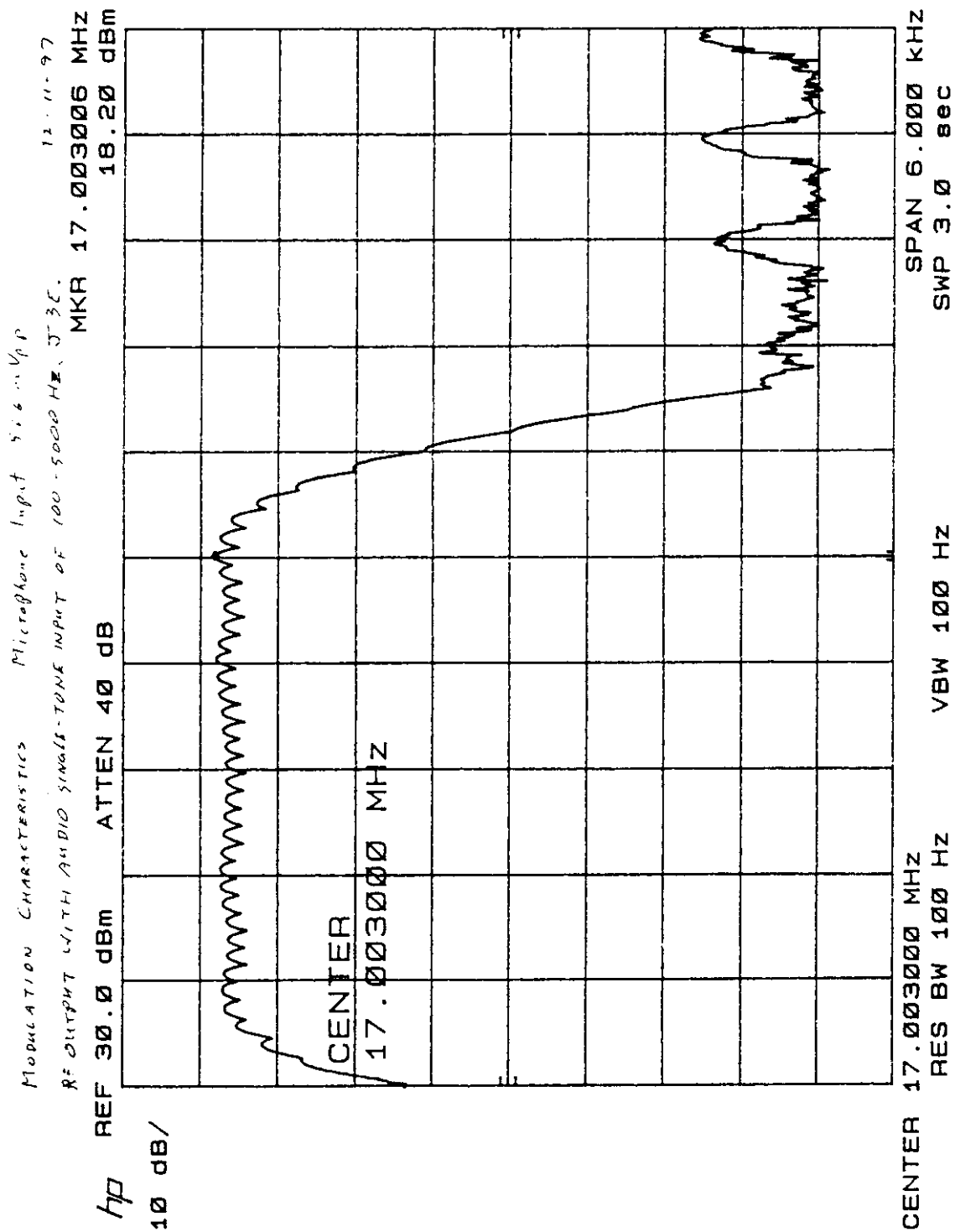
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53E at 17.00140 MHz

MODULATION CHARACTERISTICS Microphone Input 50.6 mVpp
RF OUTPUT WITH AUDIO SINGLE-TONE SWEPT INPUT: 100-5000 Hz, 38E
hp REF 30.0 dBm ATTEN 40 dB (100 Hz steps)
10 dB/



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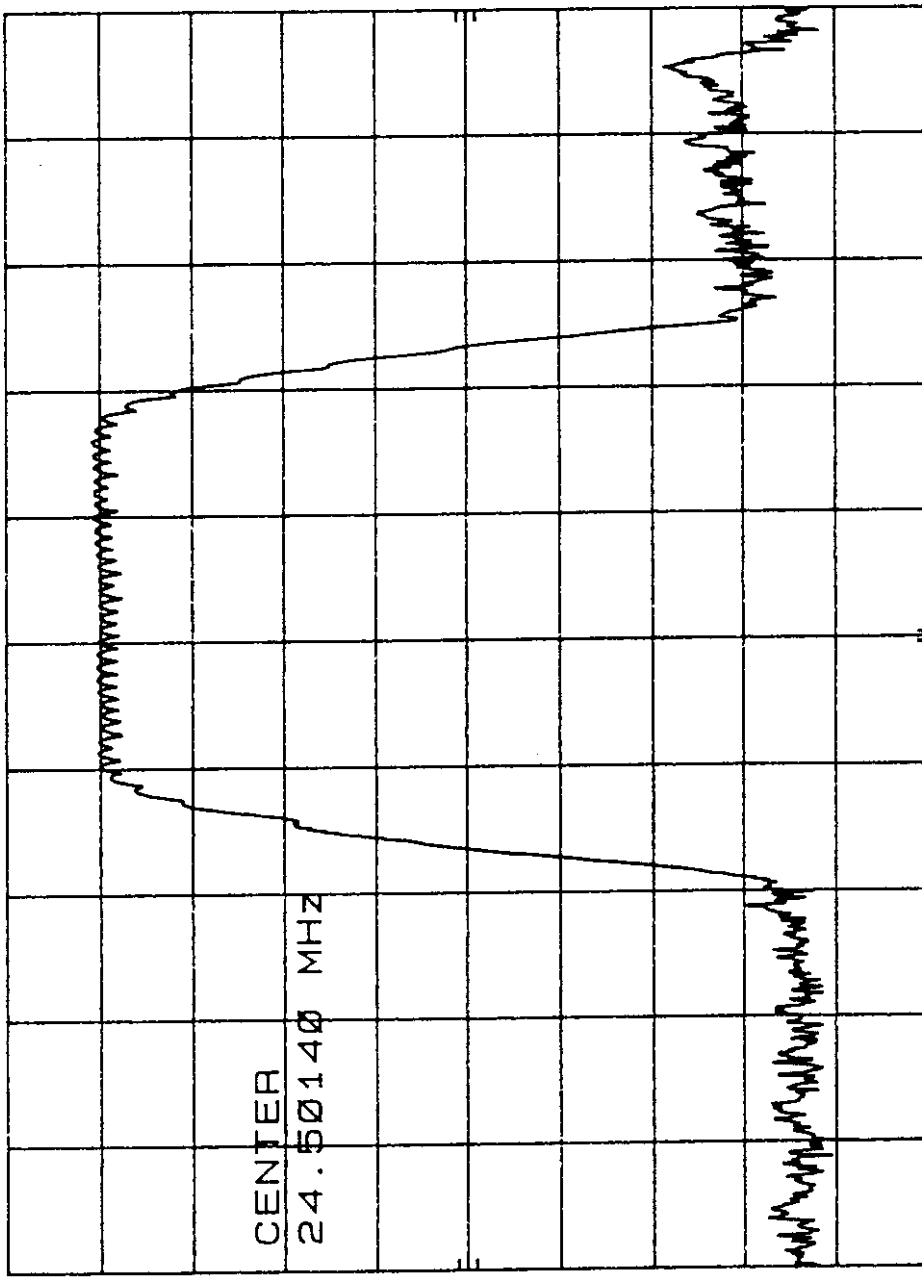
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J3E 24.5 MHz

MODULATION CHARACTERISTICS, Microphone Input 500 mVpp
RF Output with Audio Single-Tone swept input: 100 S00113, J3E
12-11-97
(100113 steps)

HP
10 dB/

REF 30.0 dBm ATTN 40 dB



SPAN 10.00 KHz
SWP 3.0 sec

VBW 100 Hz

CENTER 24.50140 MHz
RES BW 100 Hz

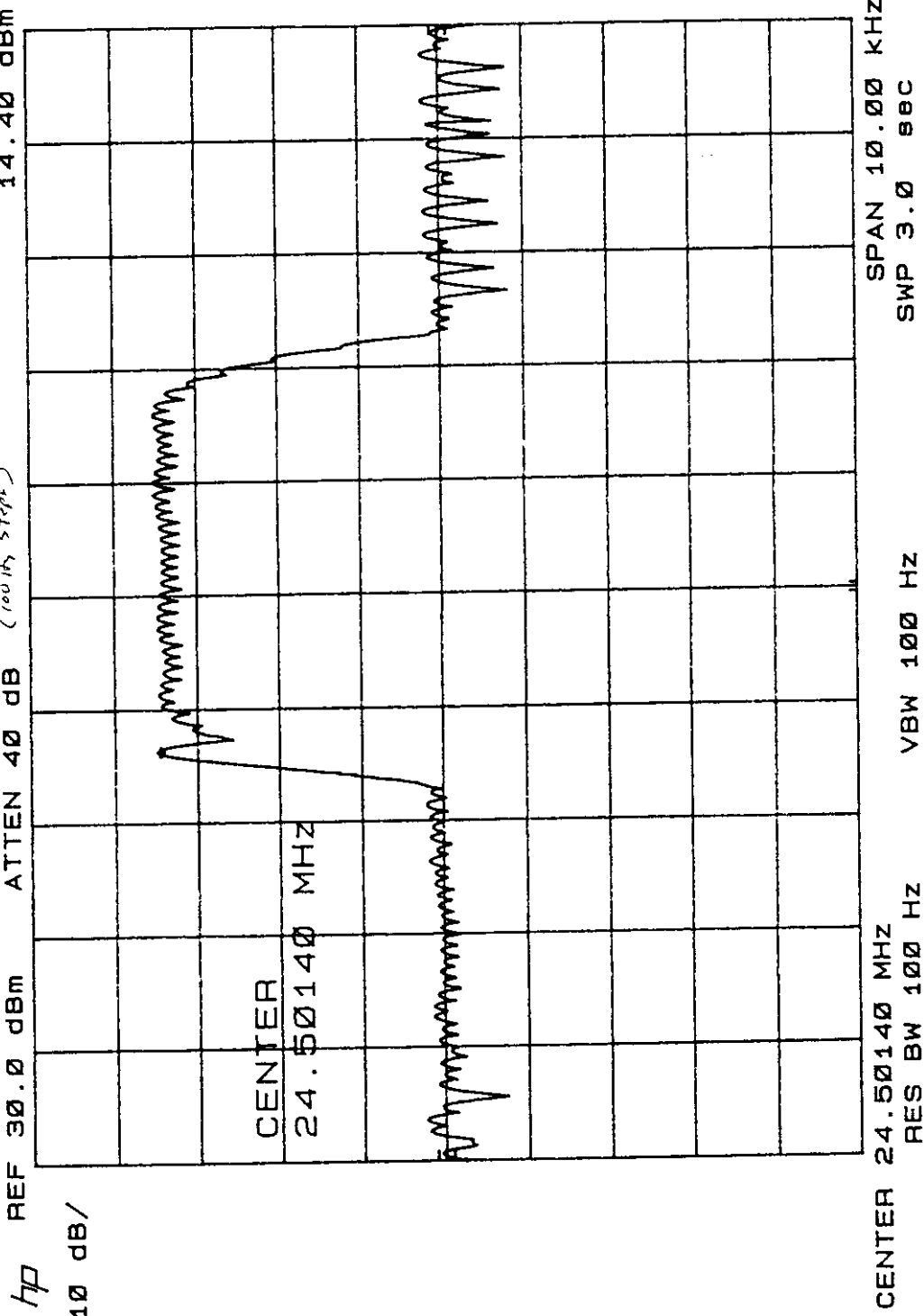
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HSE 2 FIVE

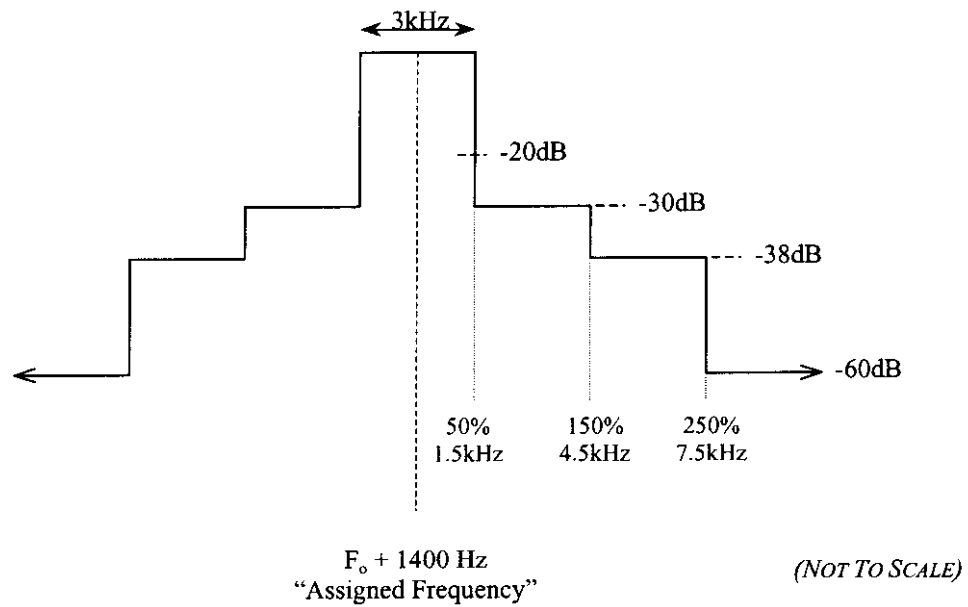
MODULATION CHARACTERISTICS, Microphone Input 100-500Hz, H3E
RF Output with Audio Single-Tone Sweep Input: 100-500Hz, H3E
12-11-97
MKR 24.50002 MHz
14.40 dBm



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8.5 Occupied Bandwidth Test Results (§2.989)

The overlay illustrated below (not to scale) was used to determine compliance with the Occupied Bandwidth test requirements of FCC CFR 47, Parts 87 and 2.



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HSE at 214 Hz

12-15-97

H/3E

1-TONE

5.8 dB

BELOW

1-TONE

1500 Hz

MKR 2.00000 MHz
14.10 dBm

1500 Hz MOD

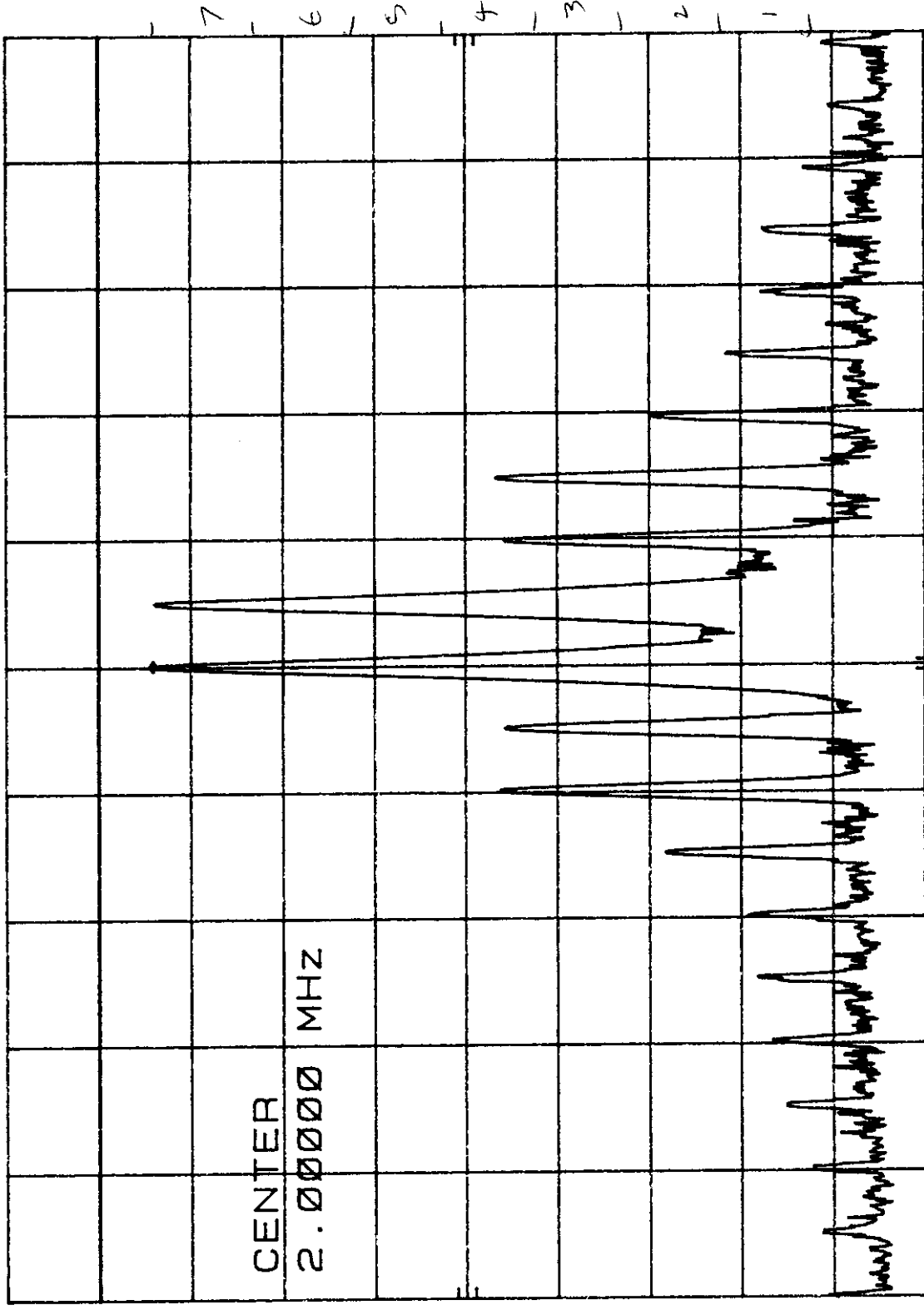
ATTEN 40 dB

REF 30.0 dBm

hp

10 dB/

DL
19.9
dBm



SPAN 30.00 KHz
SWP 7.5 sec

VBW 100 Hz

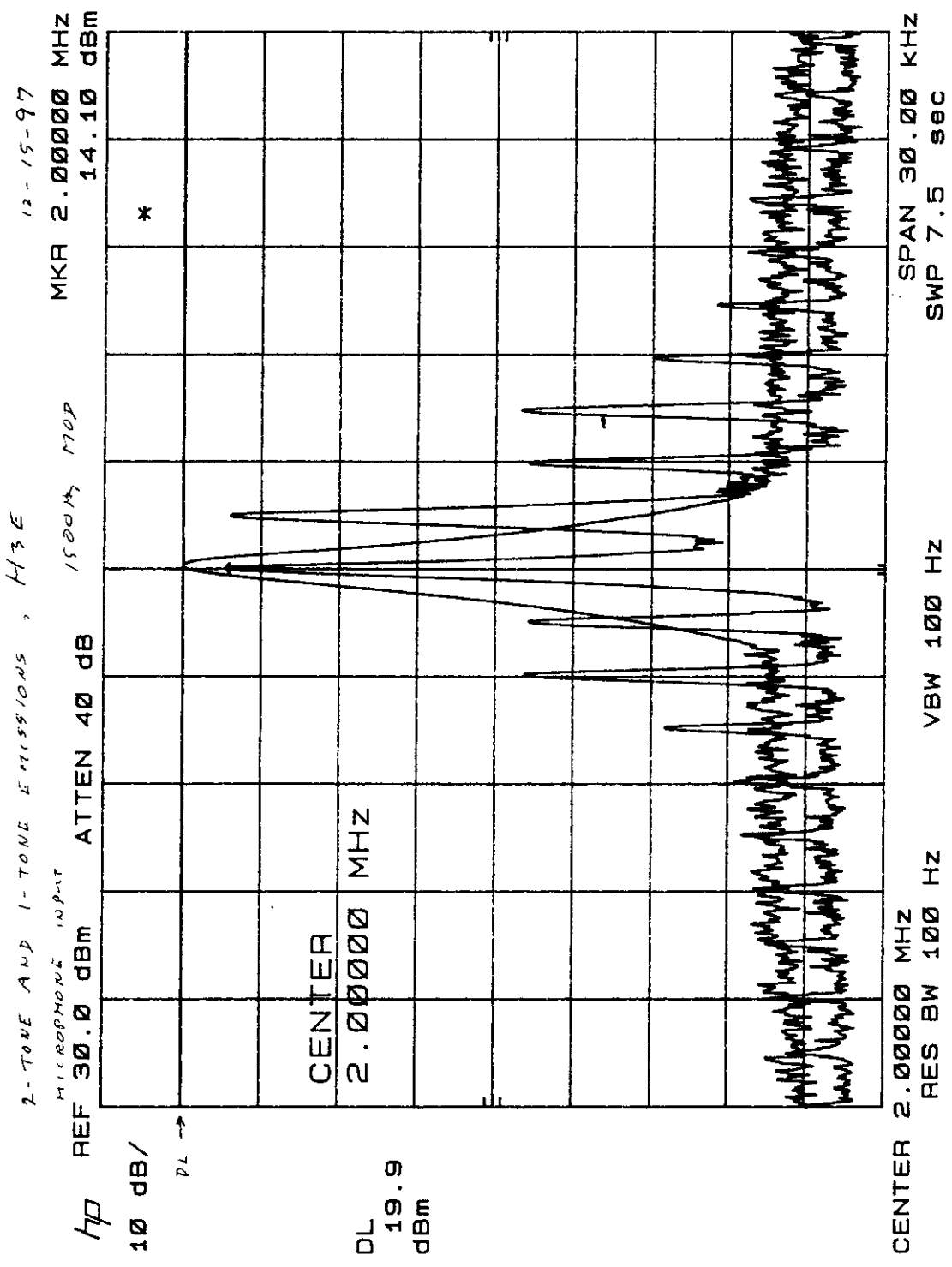
RES BW 100 Hz

CENTER 2.00000 MHz

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21MHz

173E

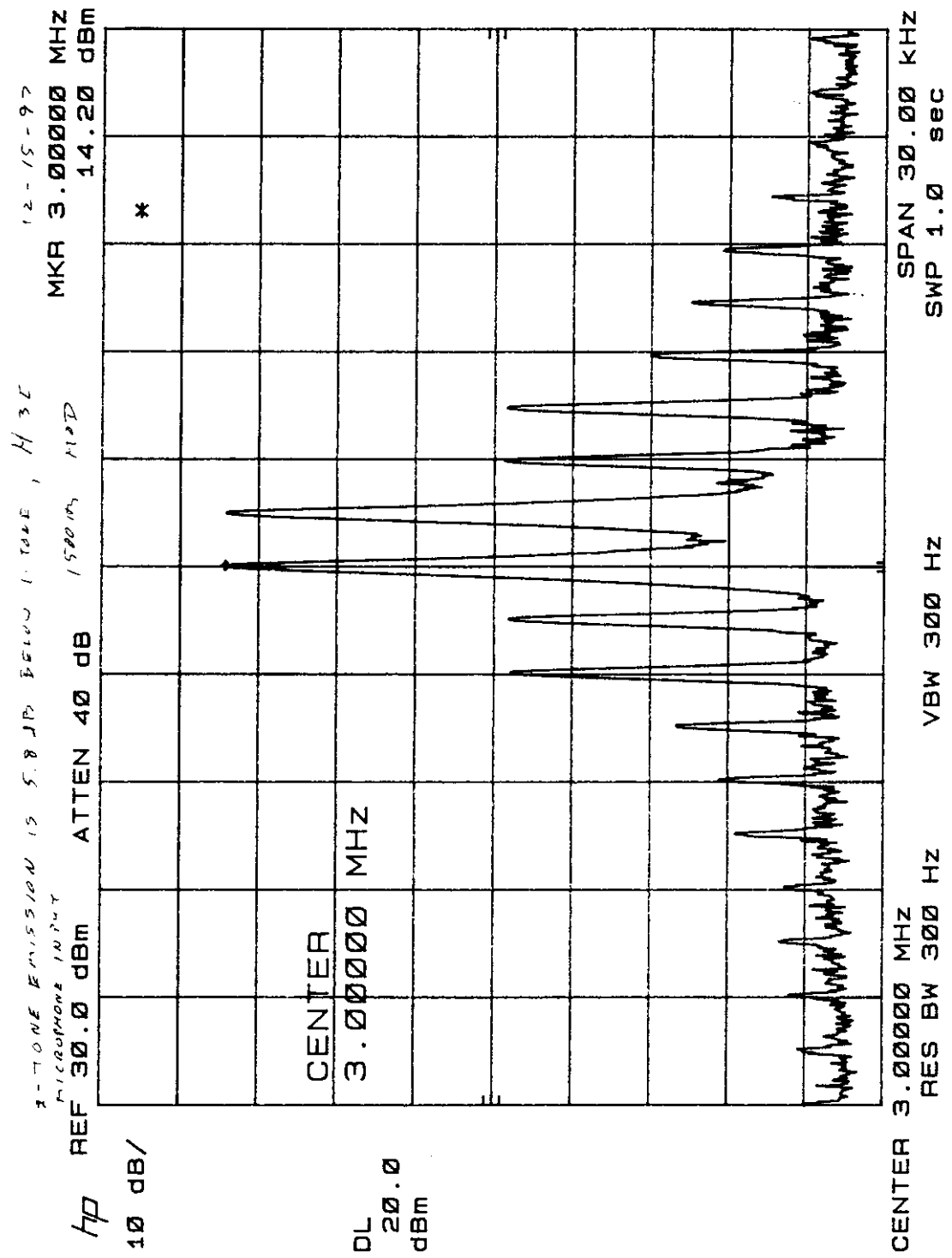


Electromagnetic Engineering Services, Inc.

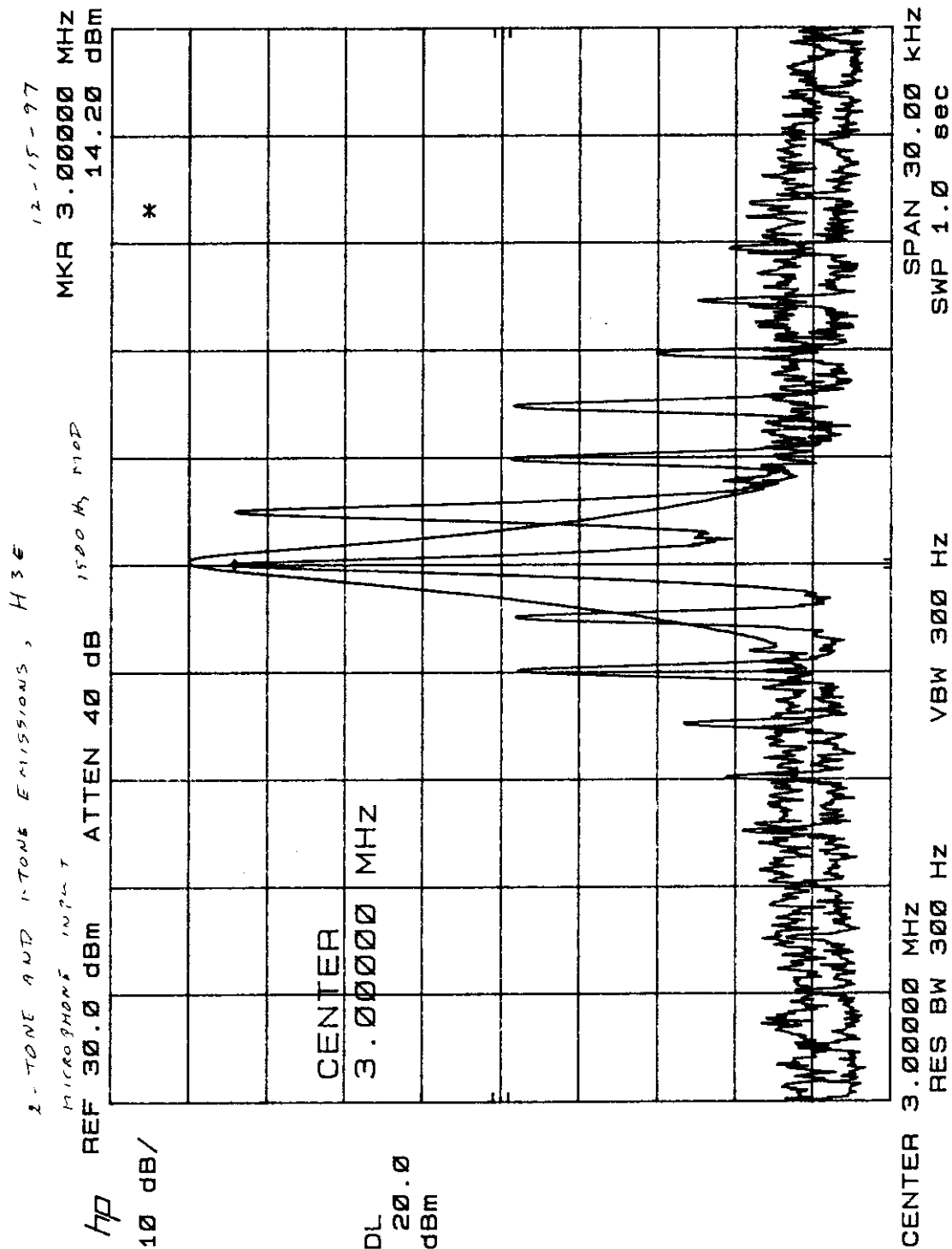
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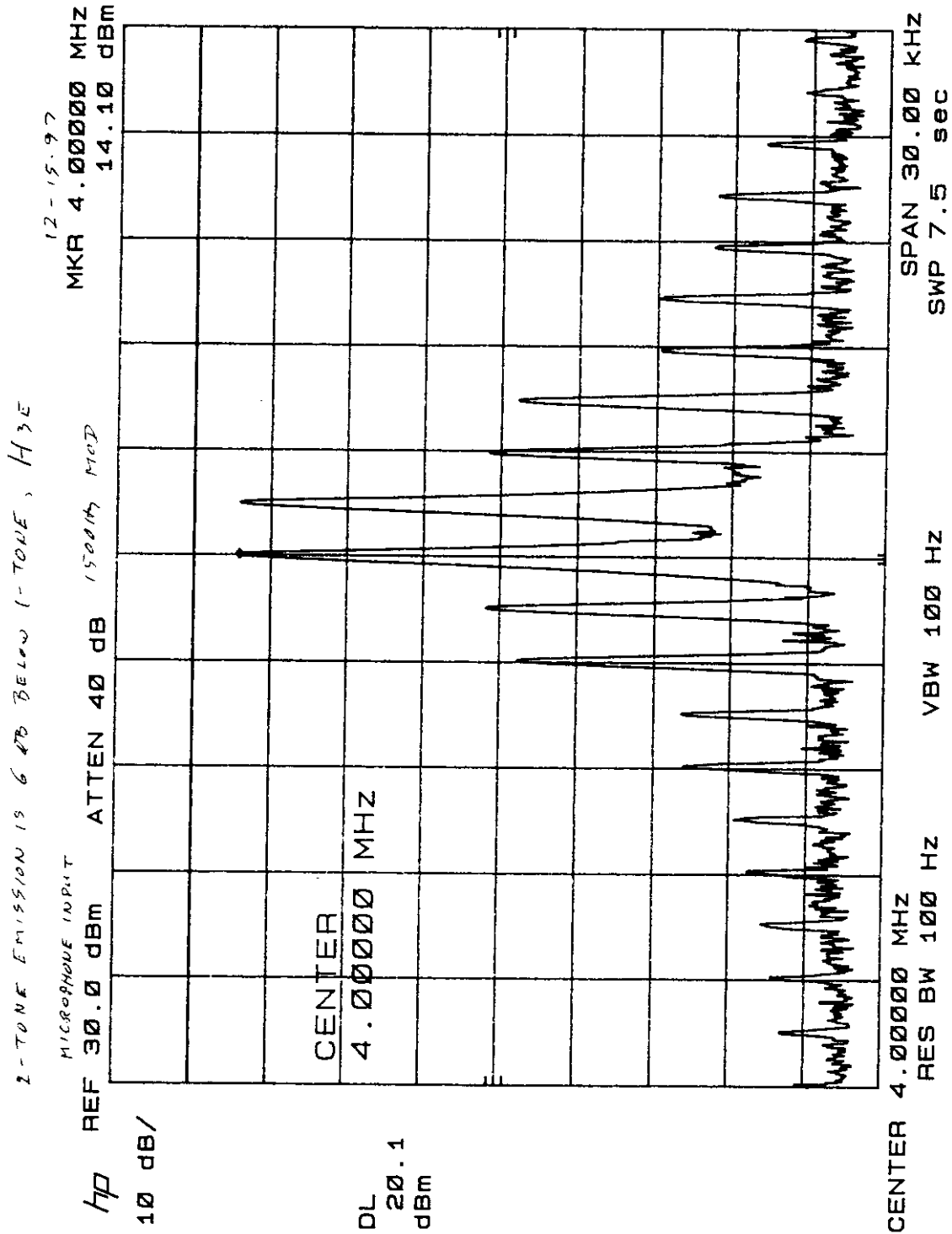
H3C
3MHz



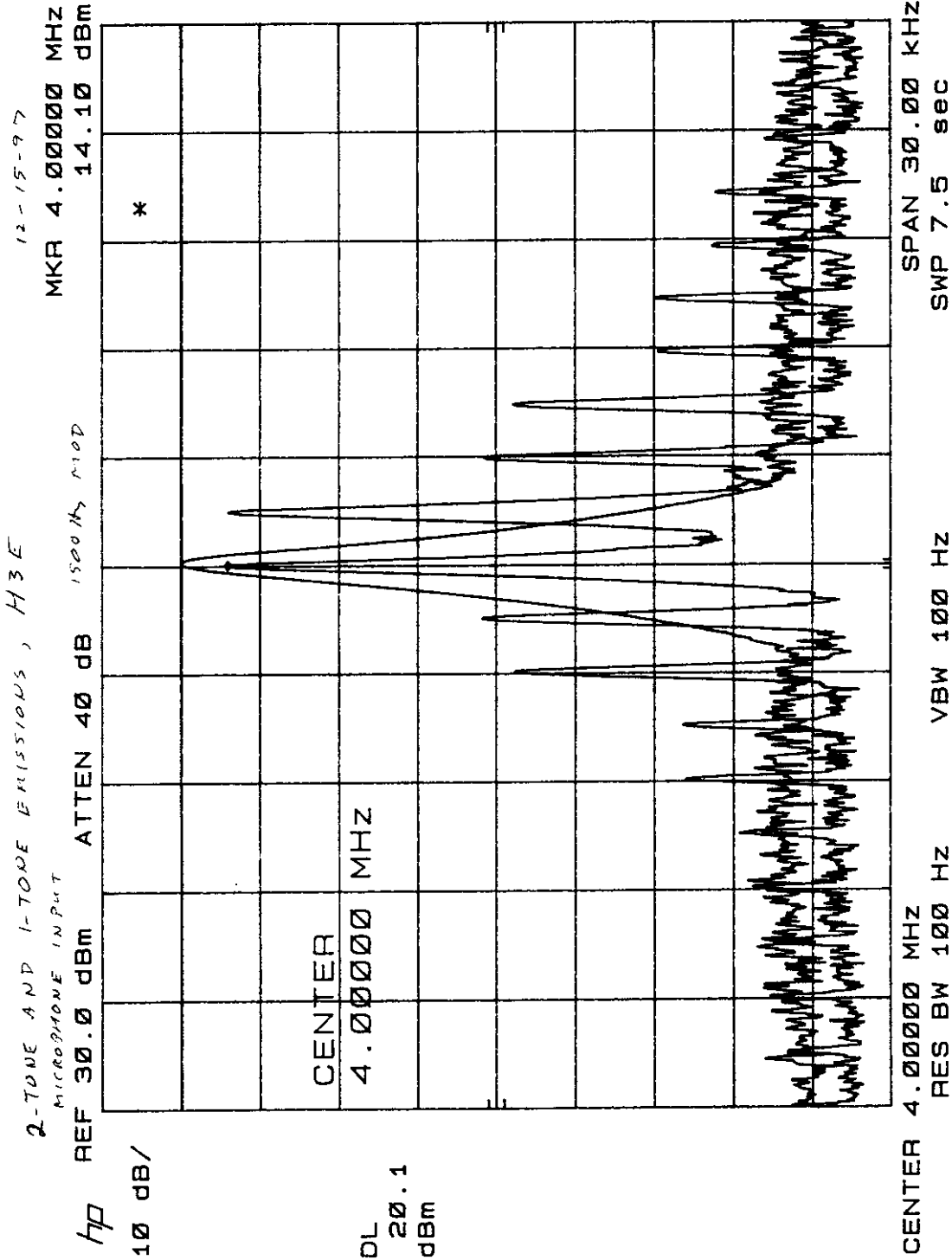
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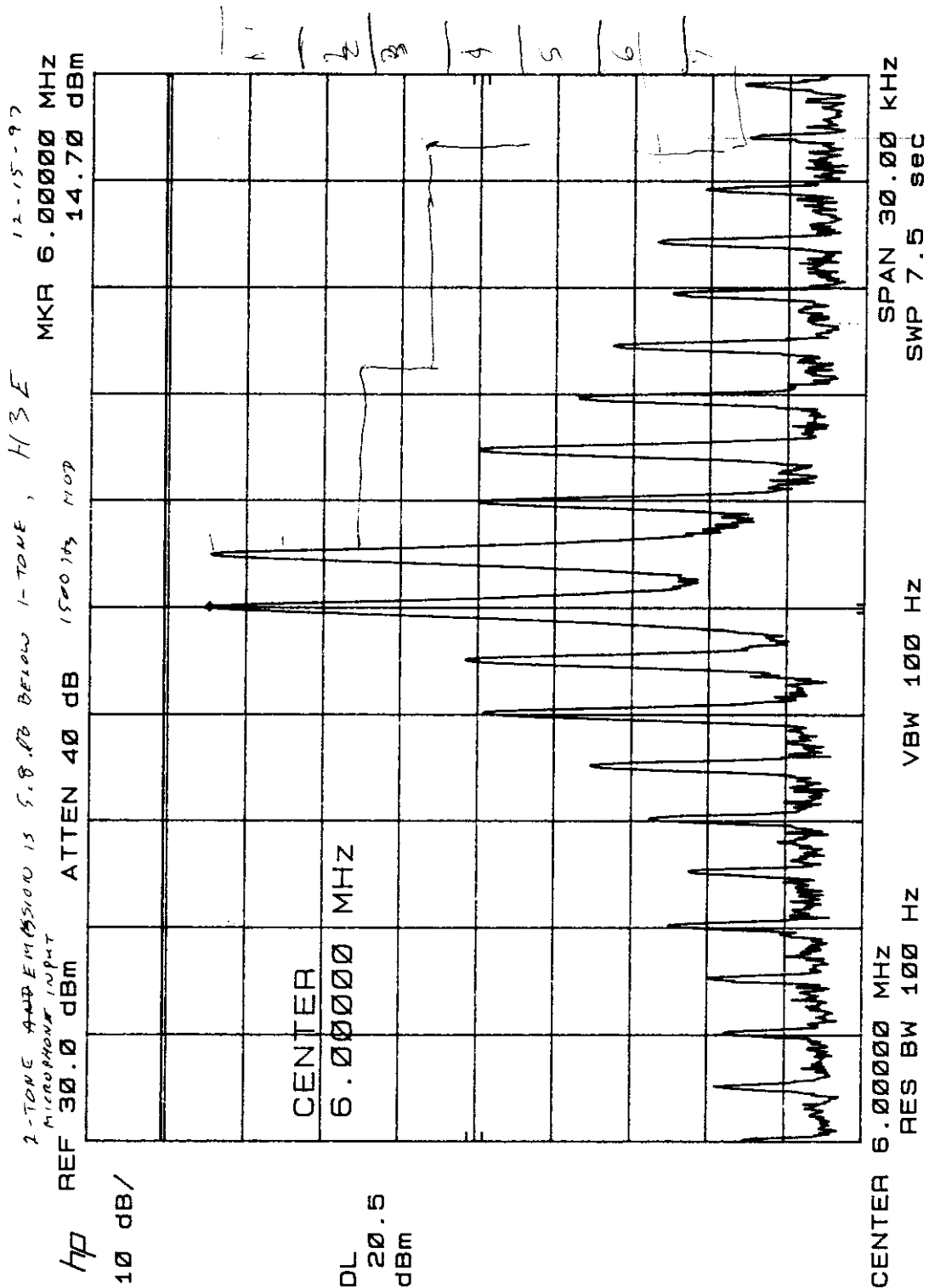
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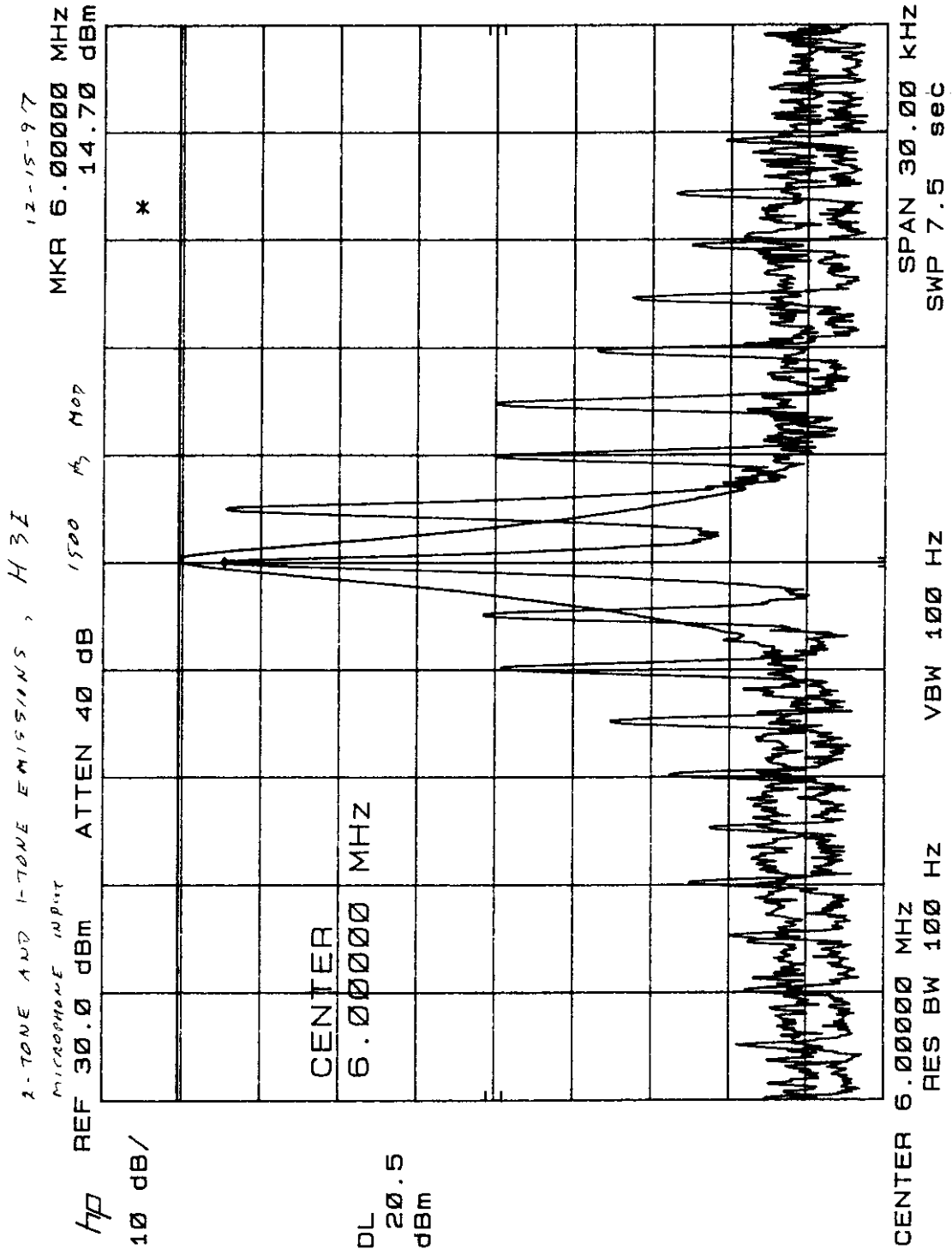


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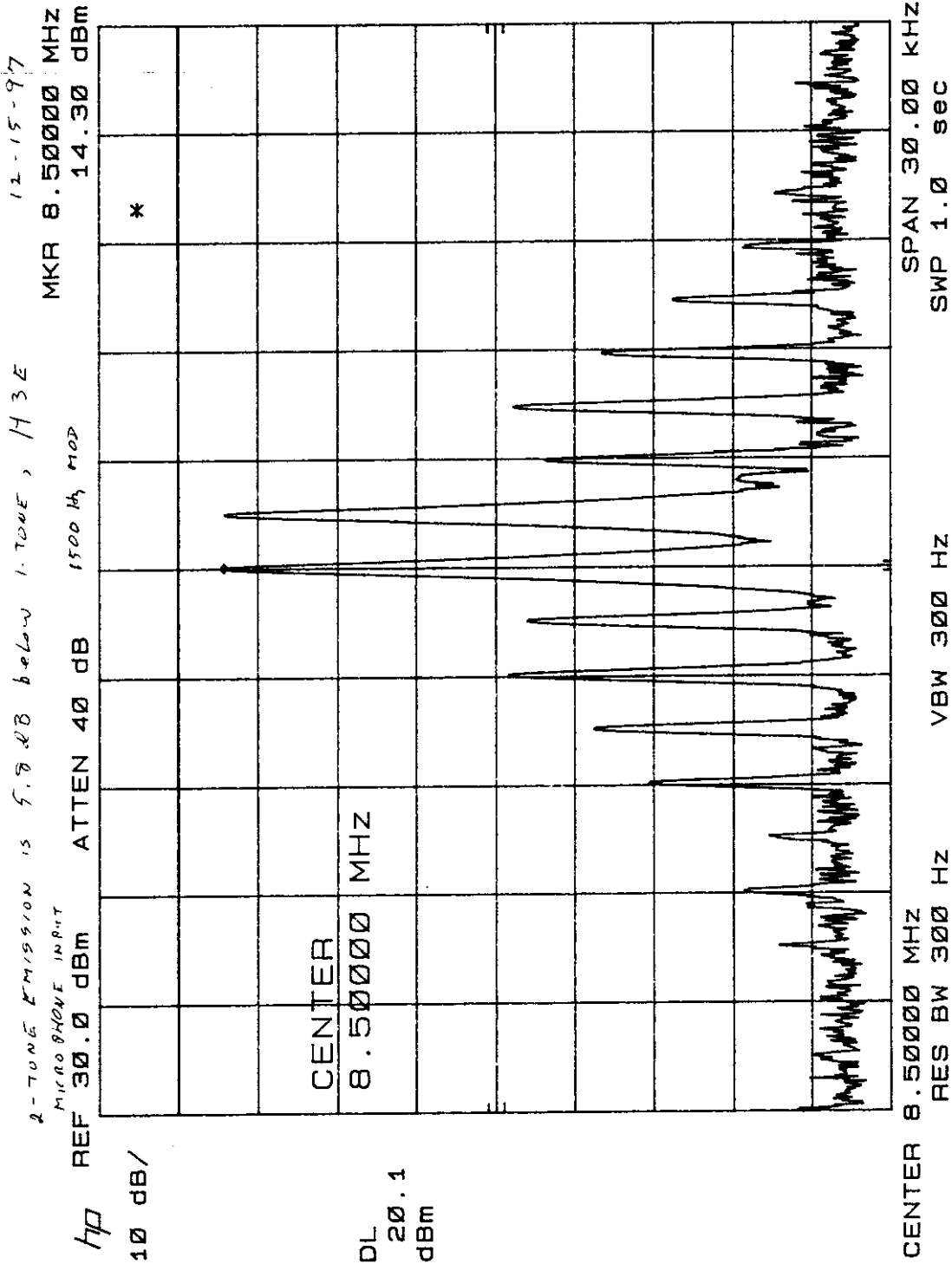


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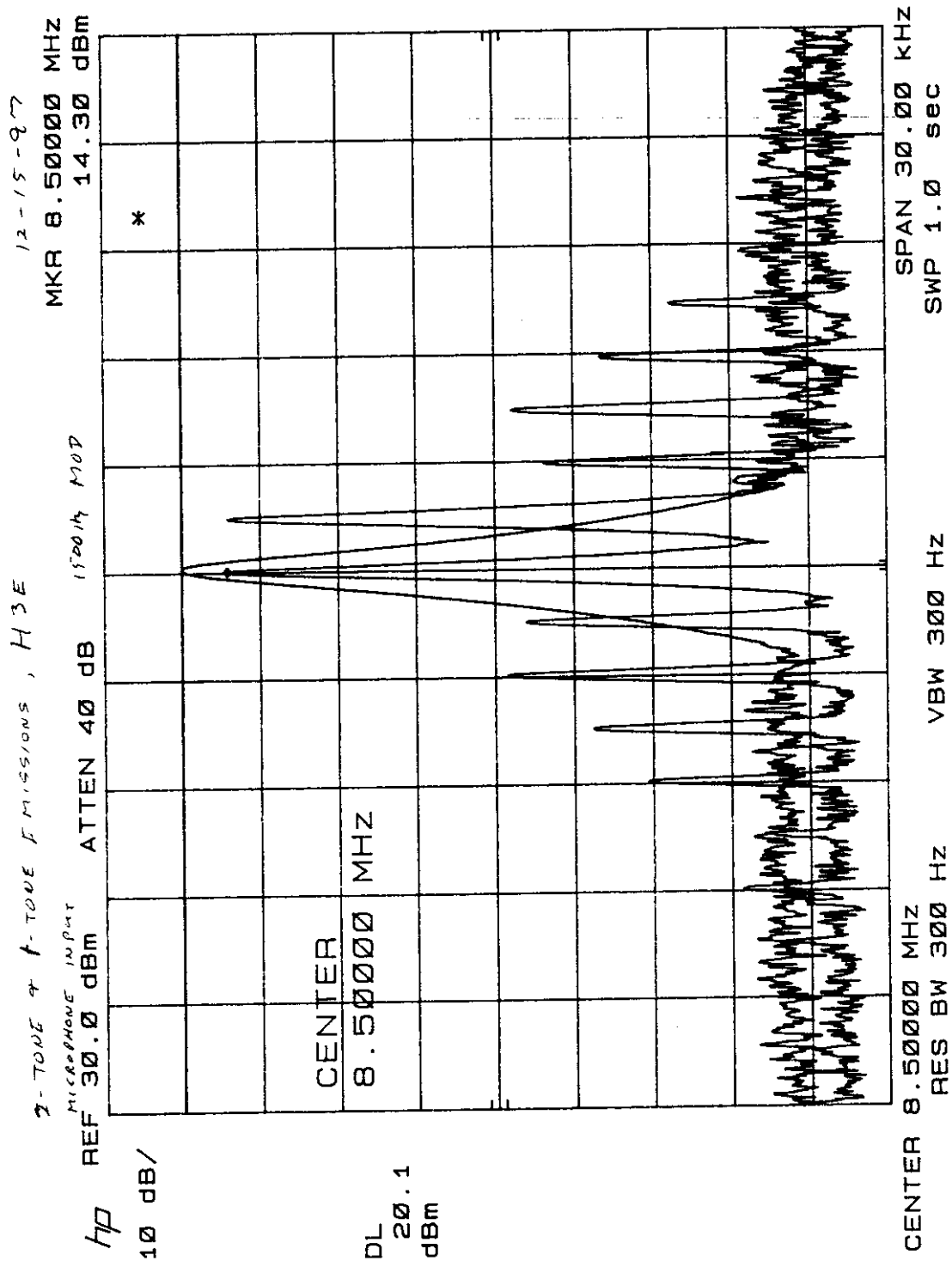




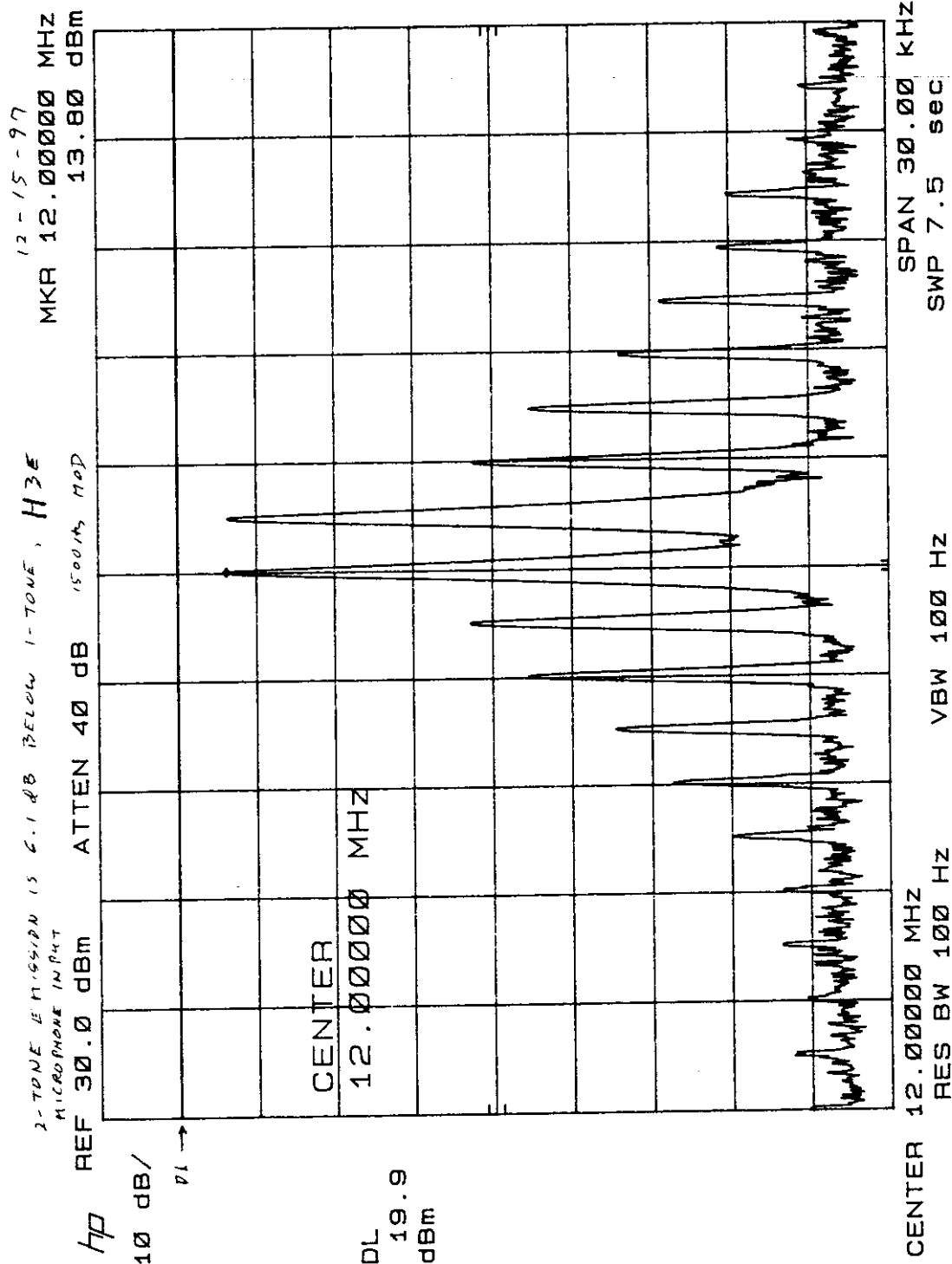
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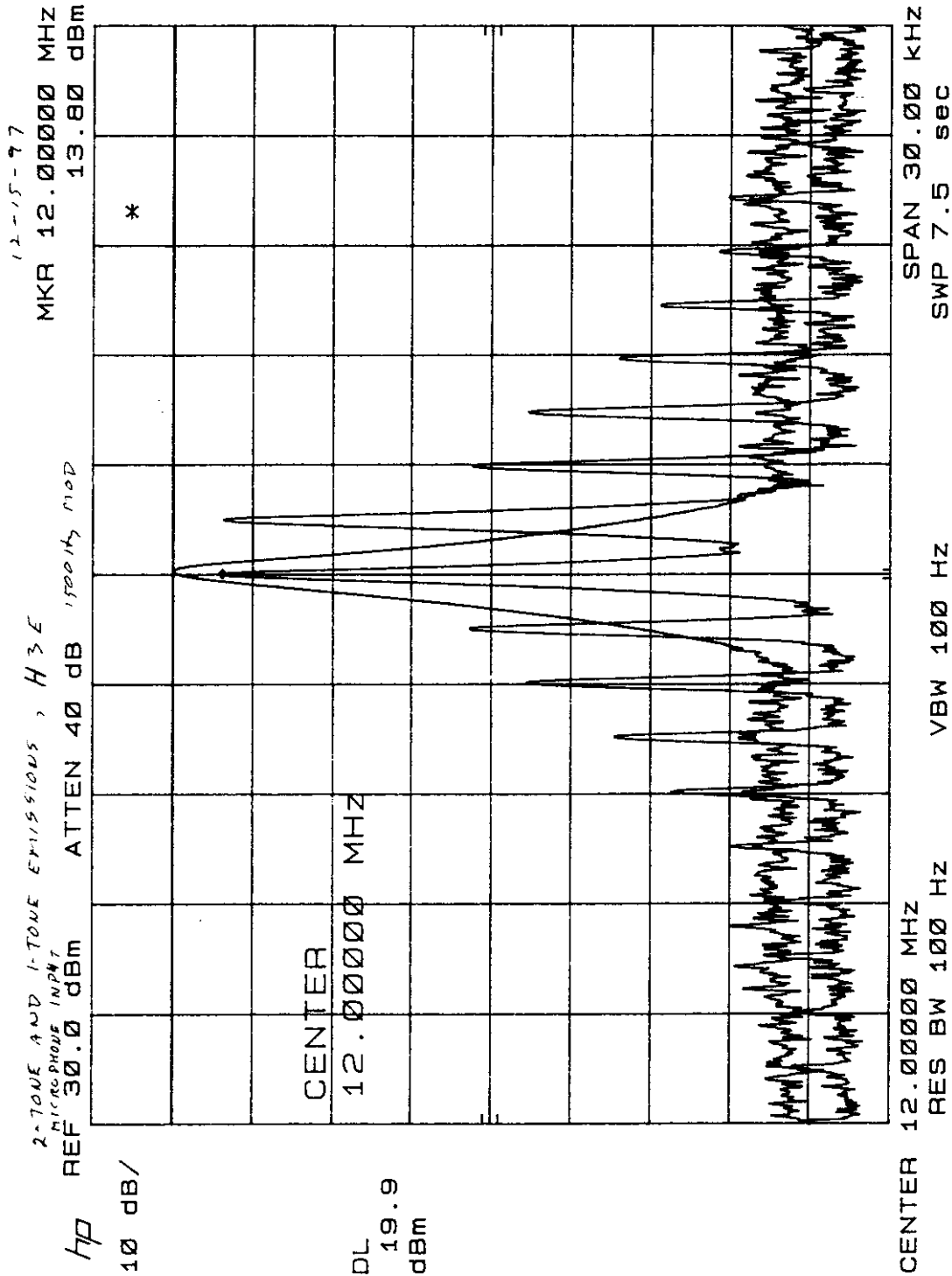
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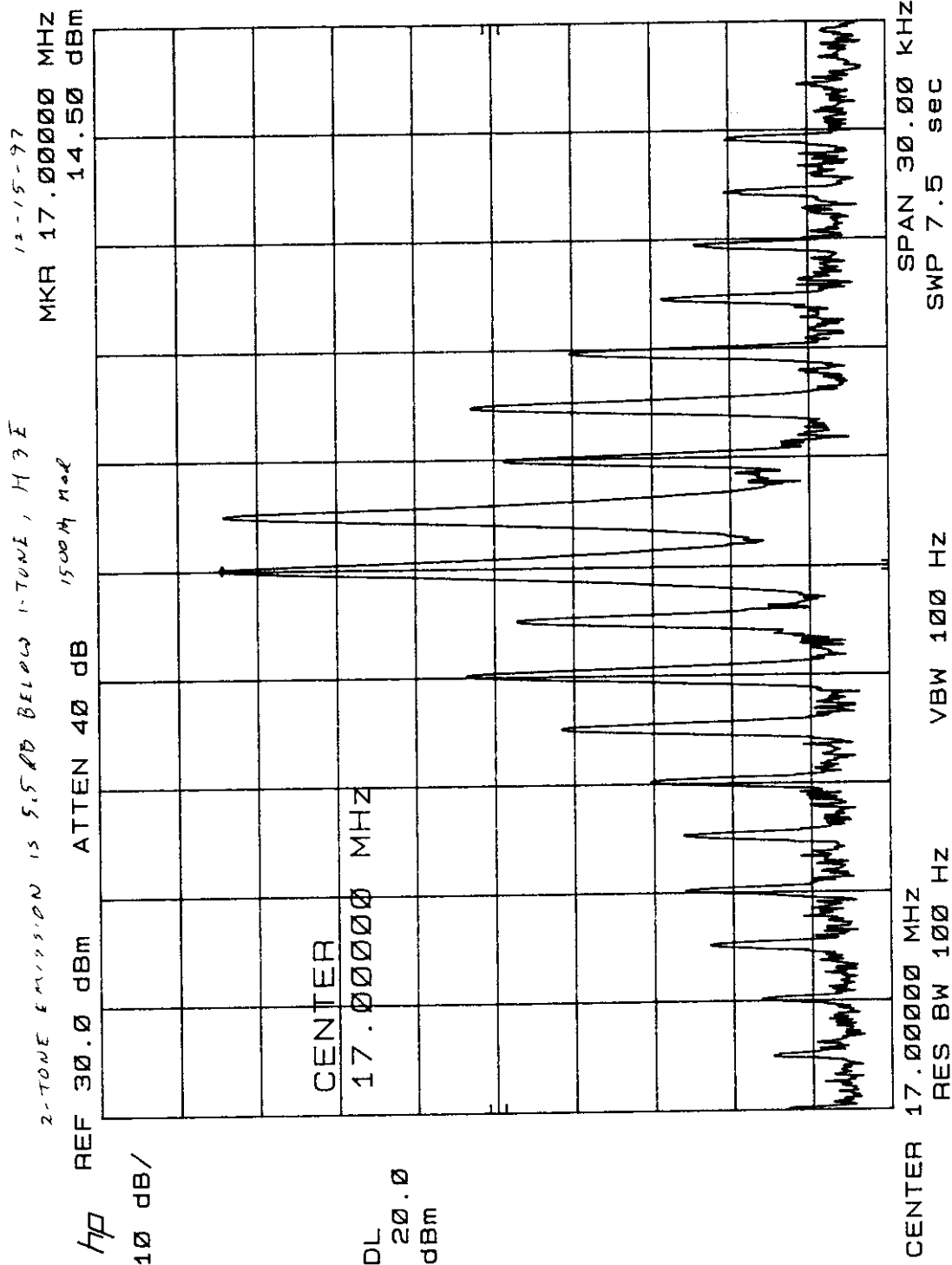
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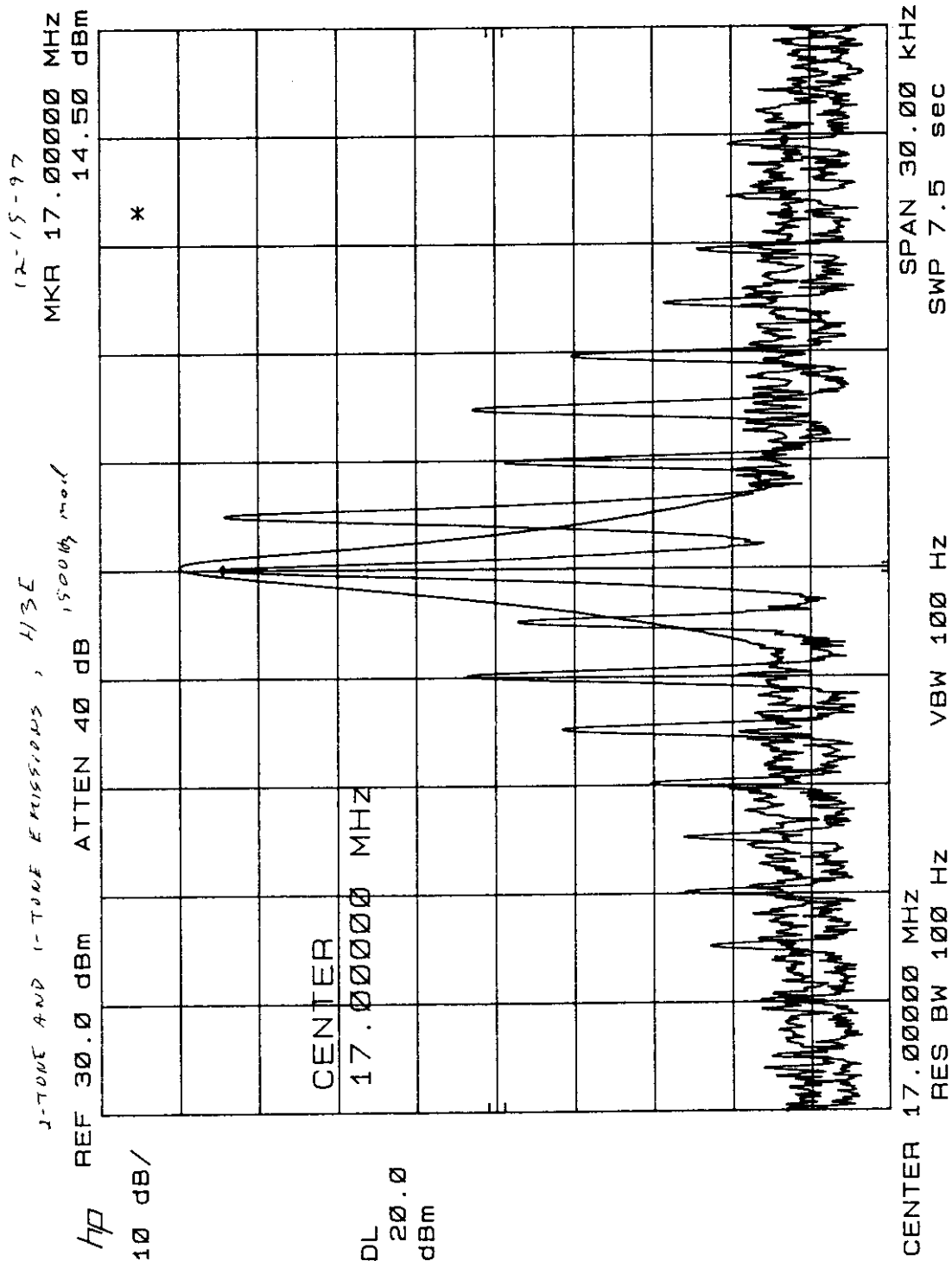
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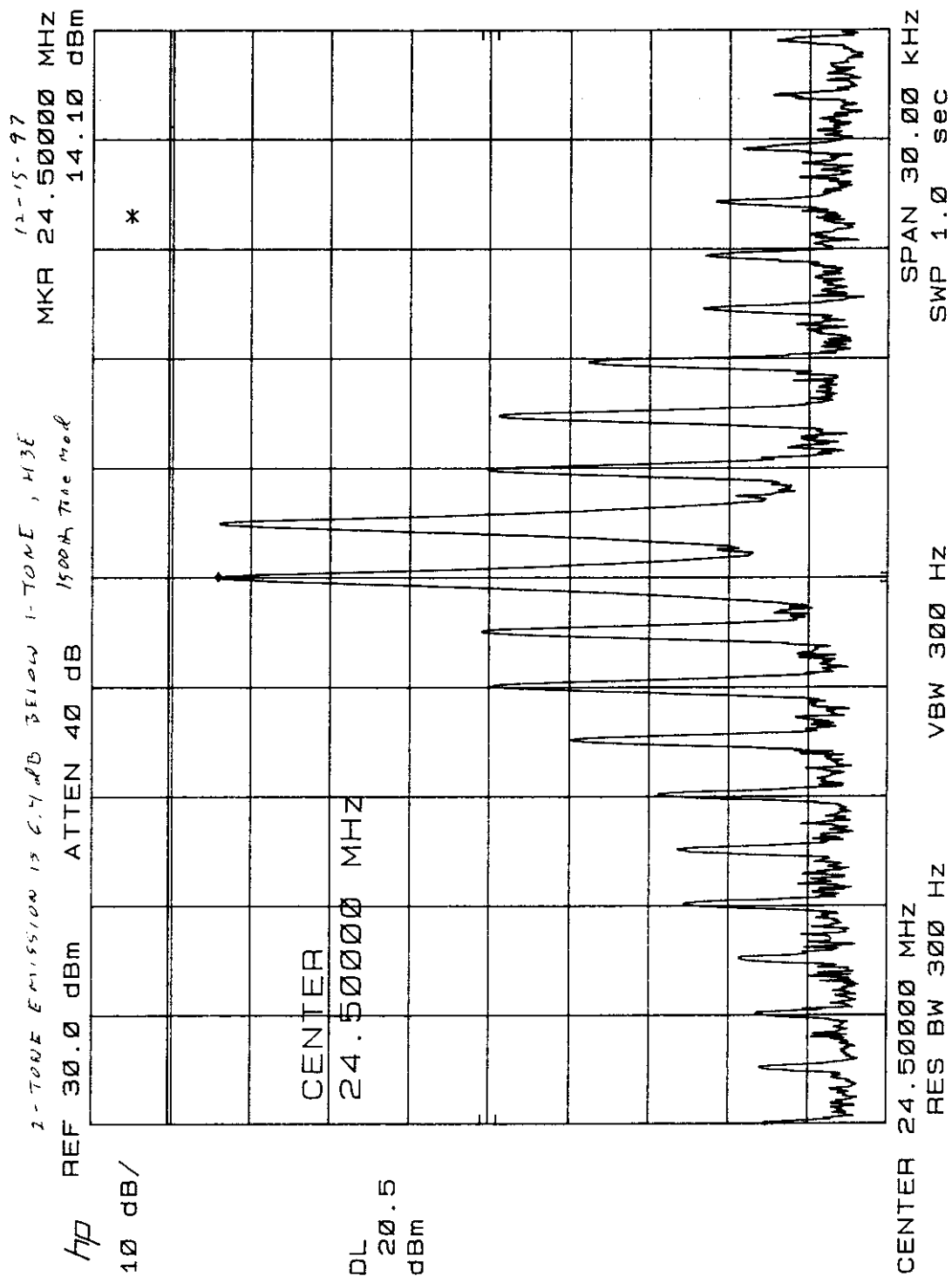
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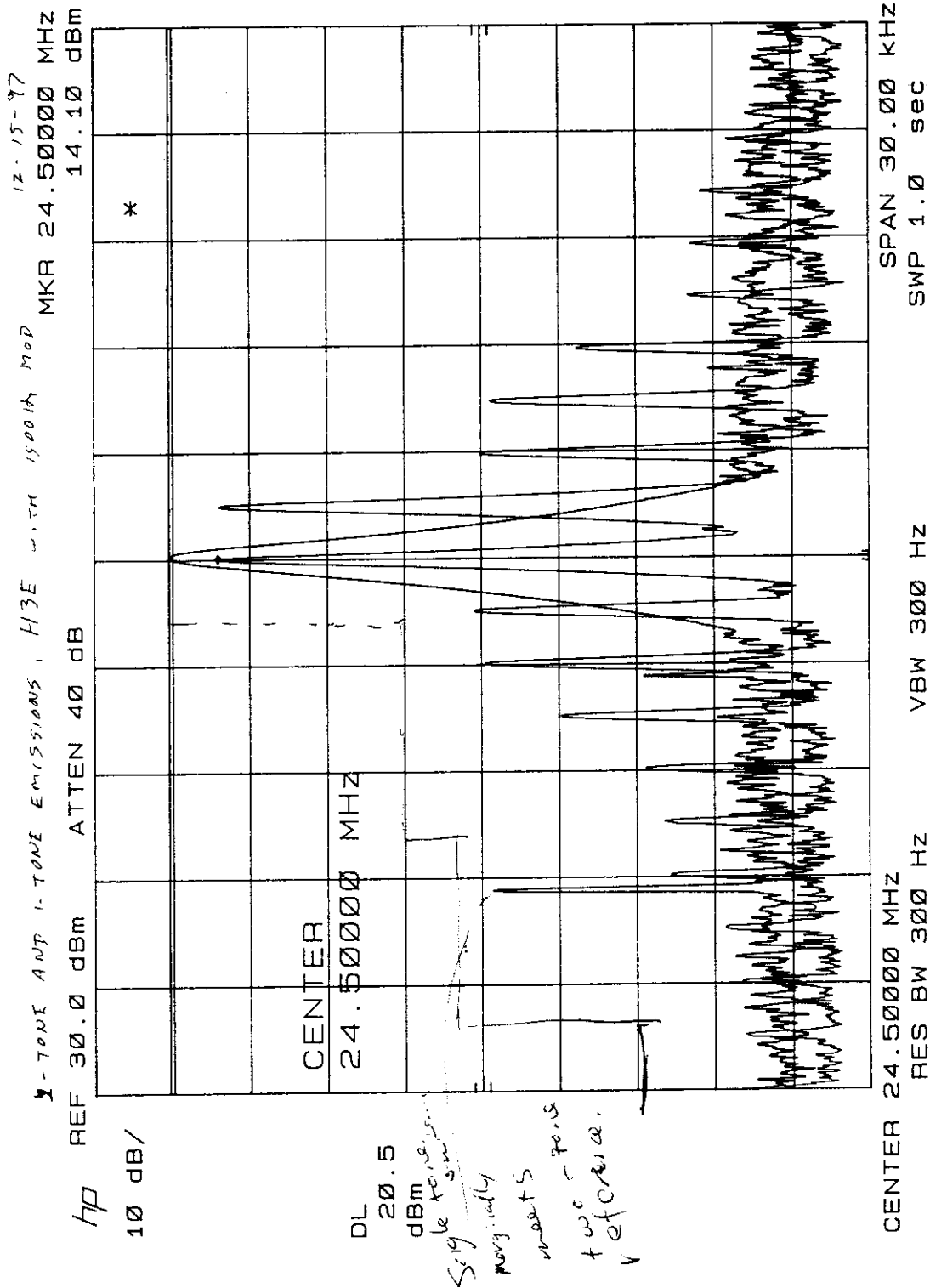
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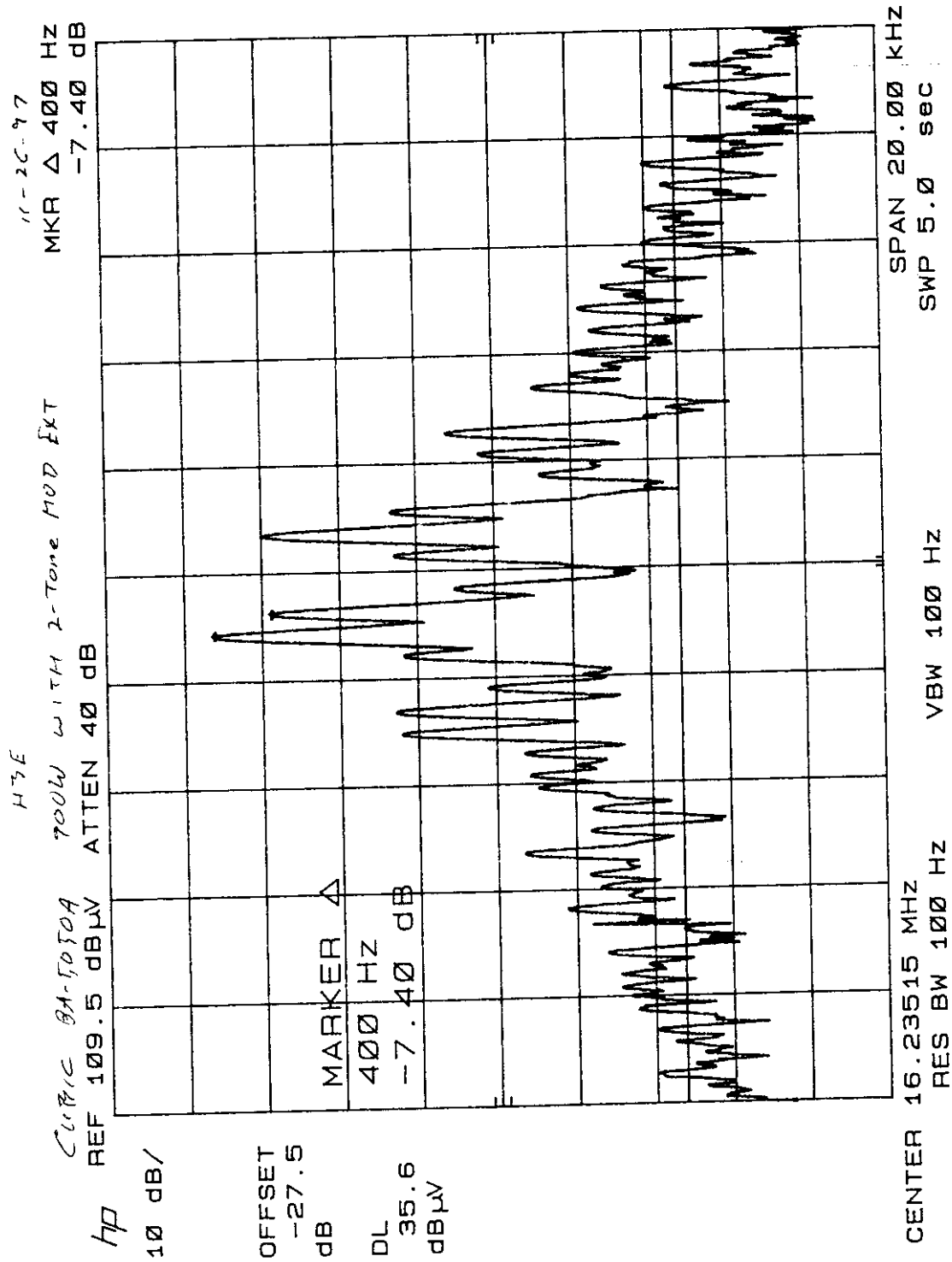
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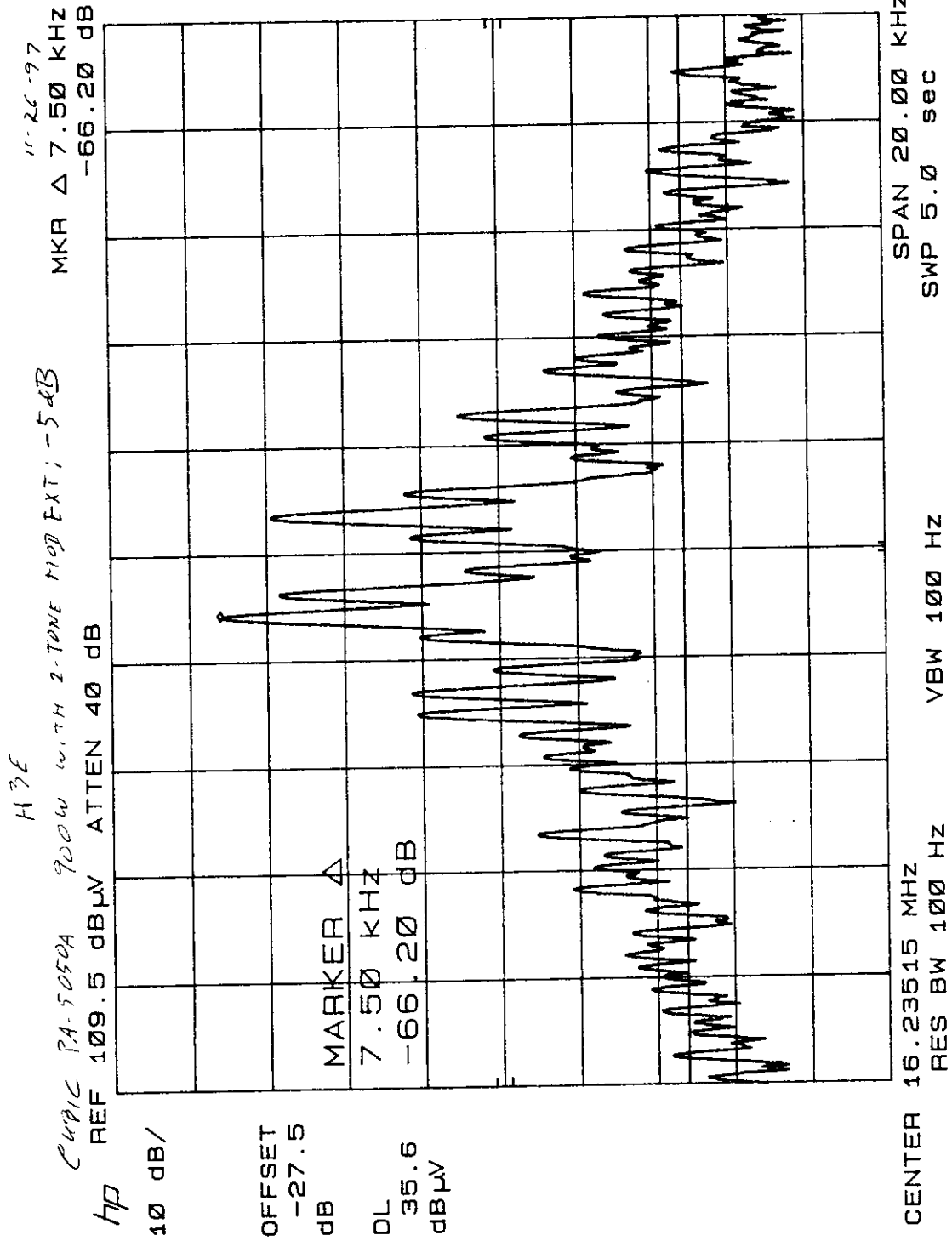
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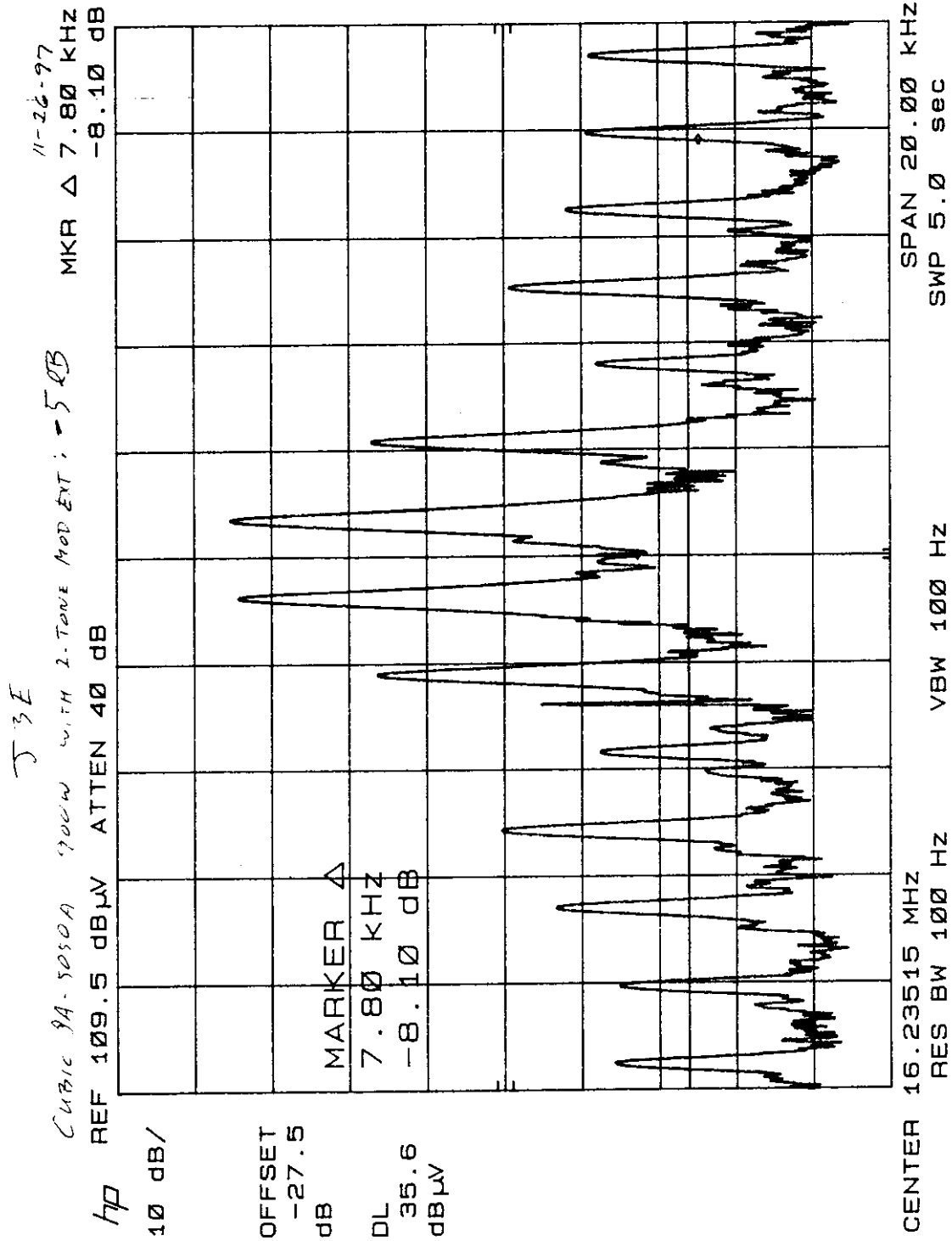
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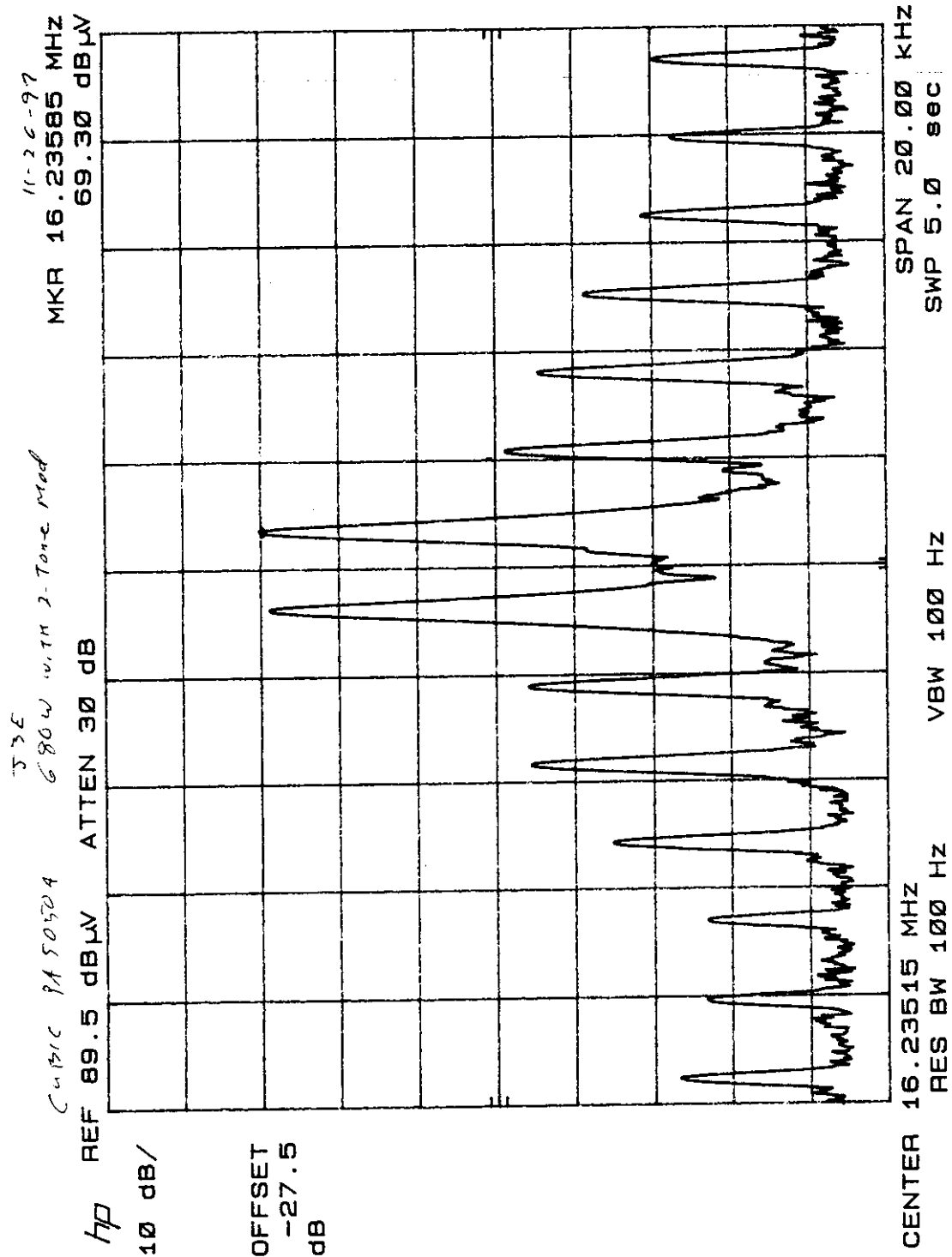
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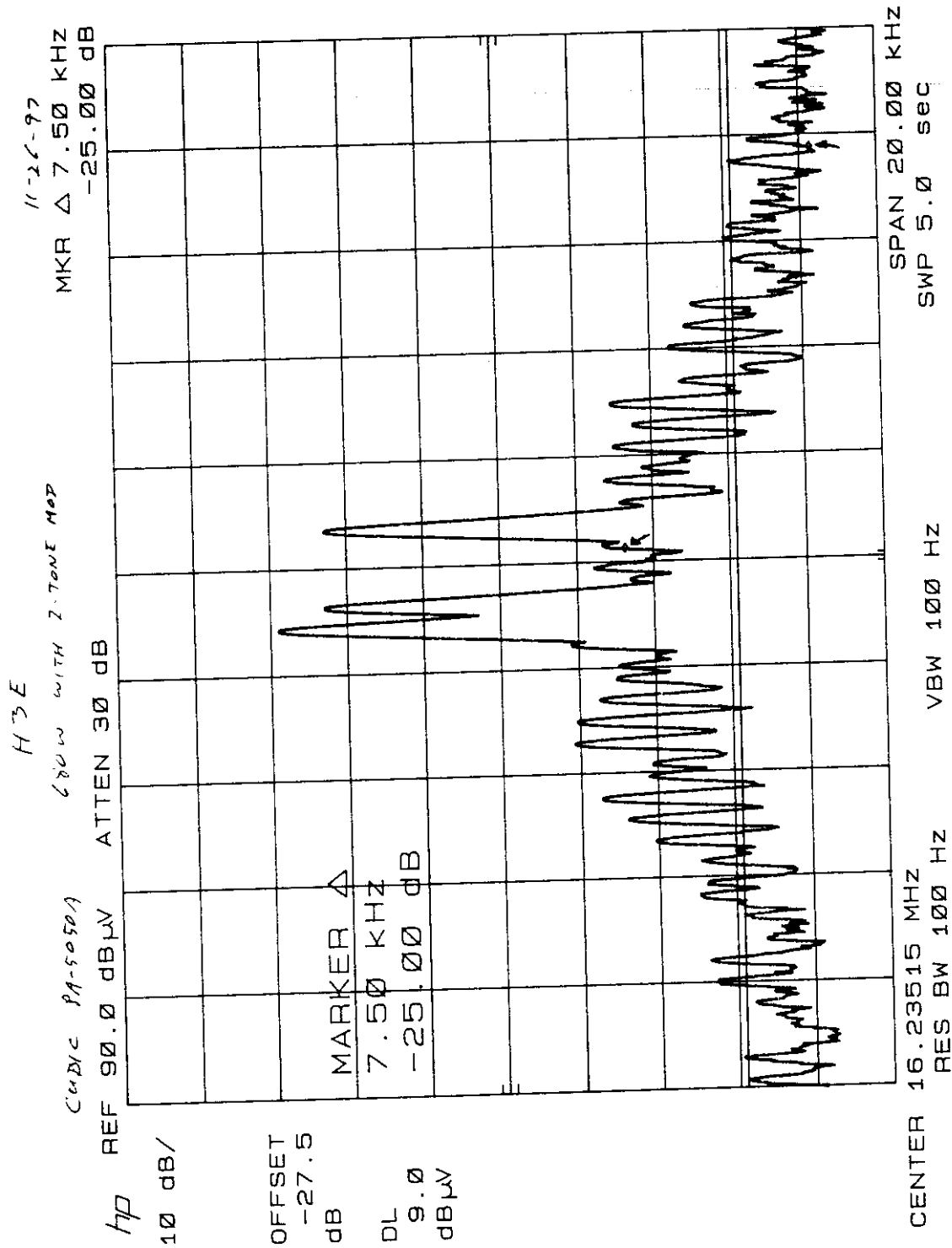
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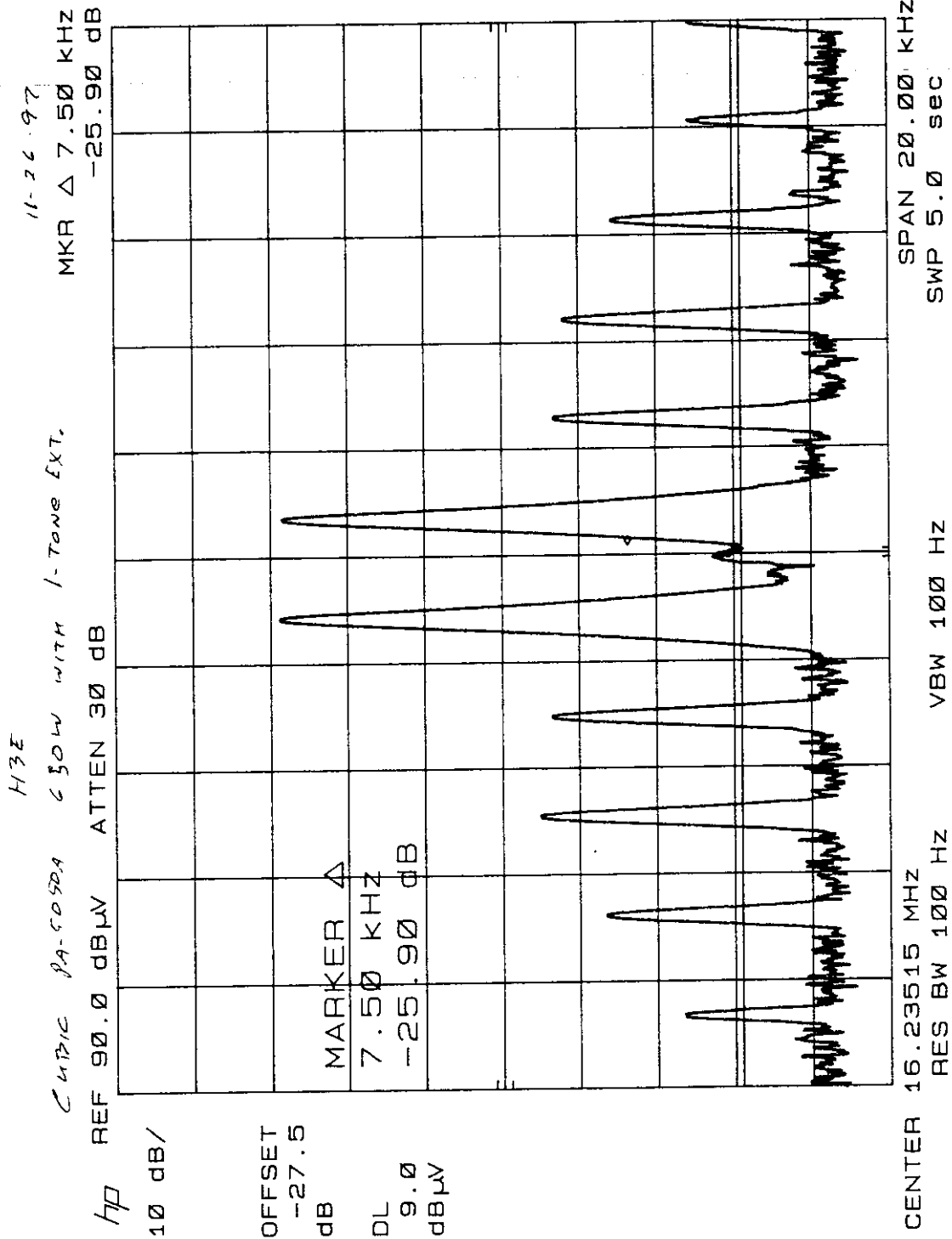
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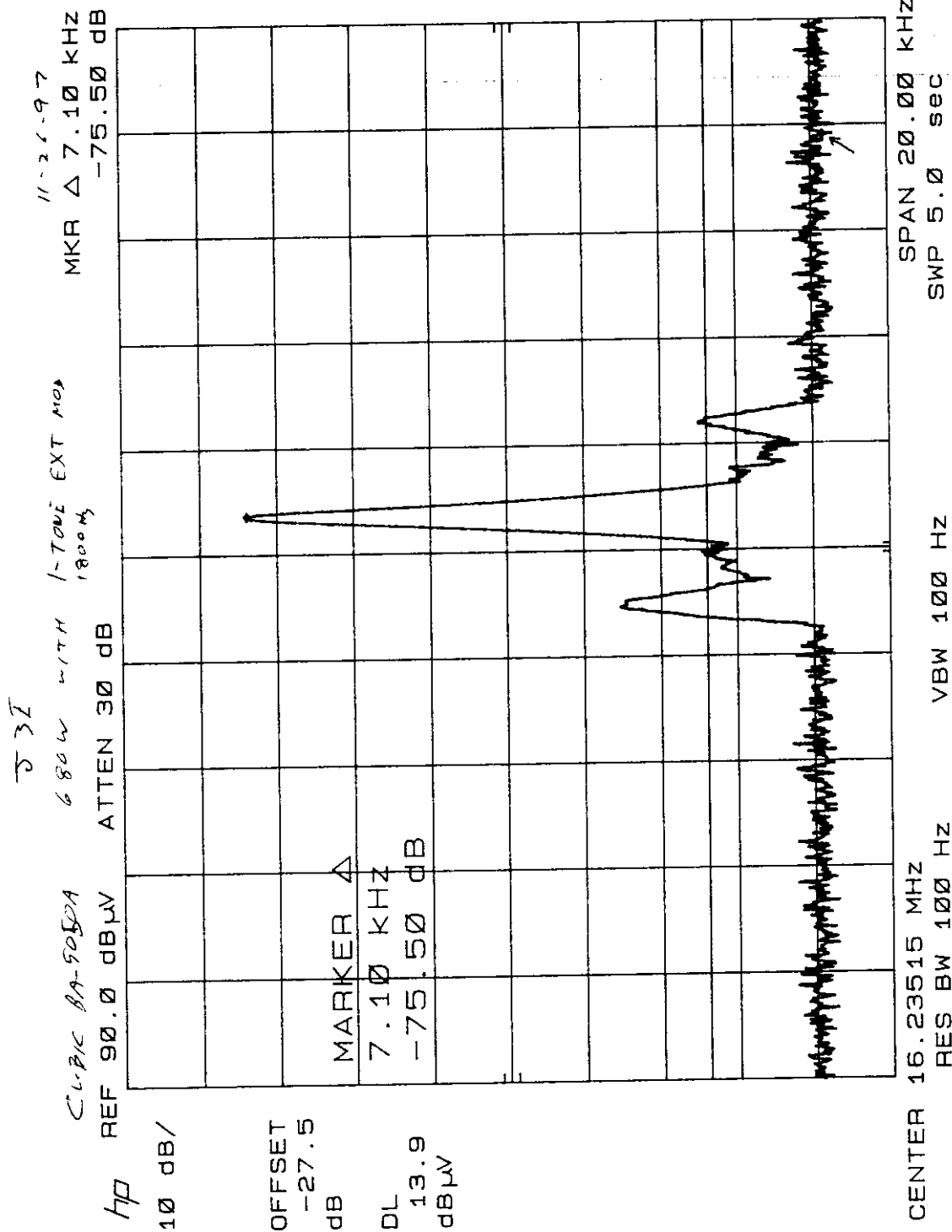
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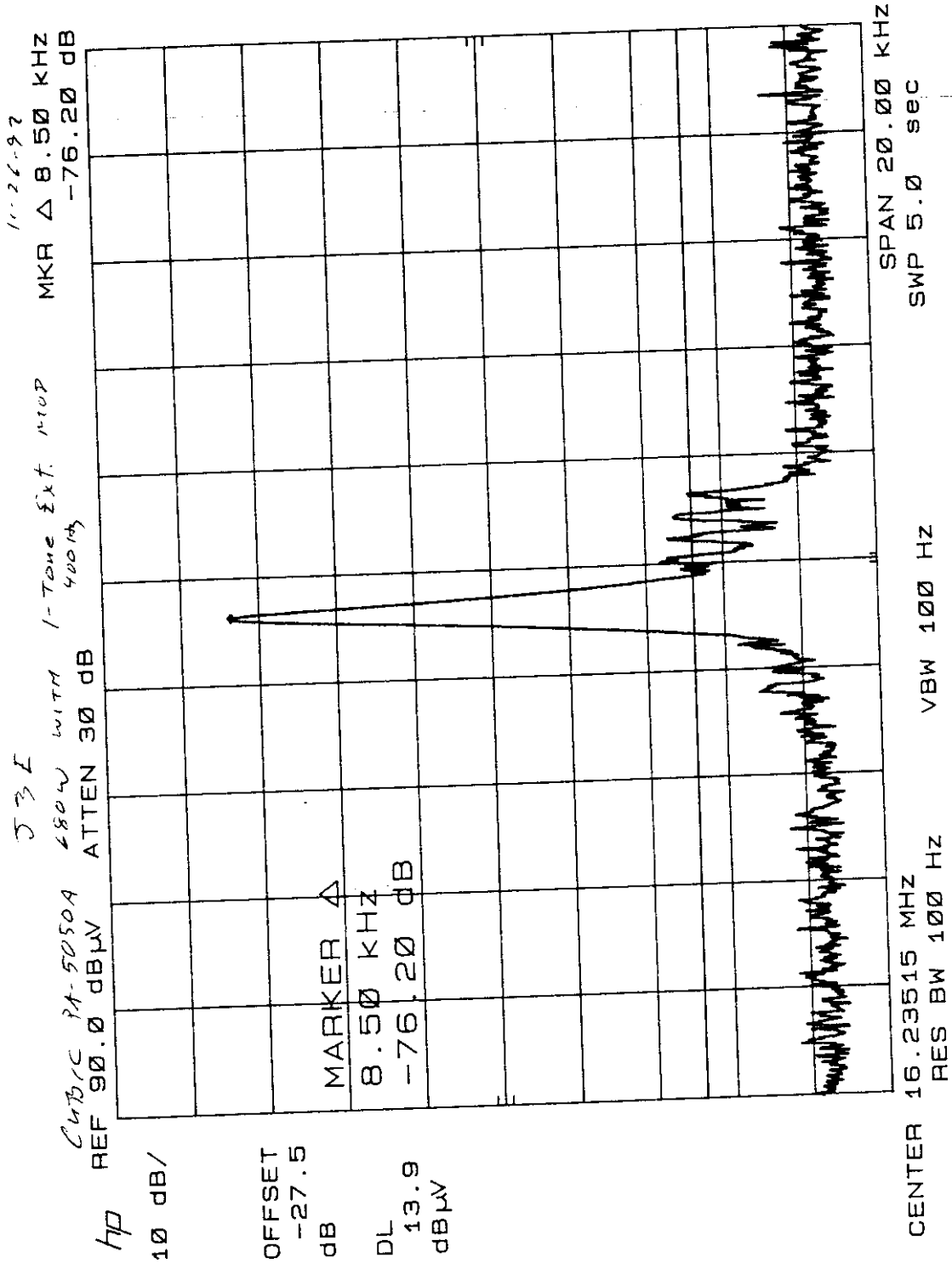
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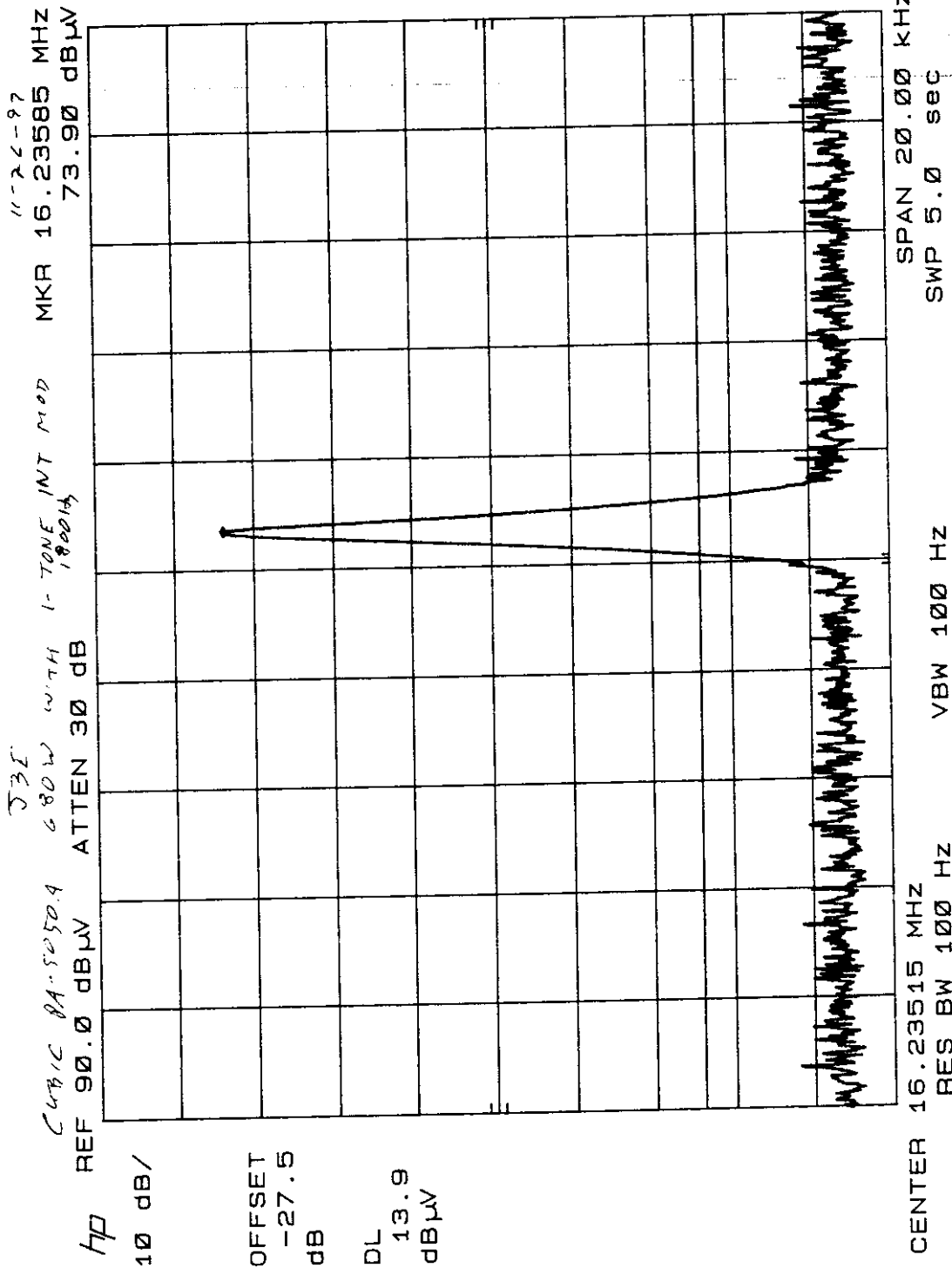
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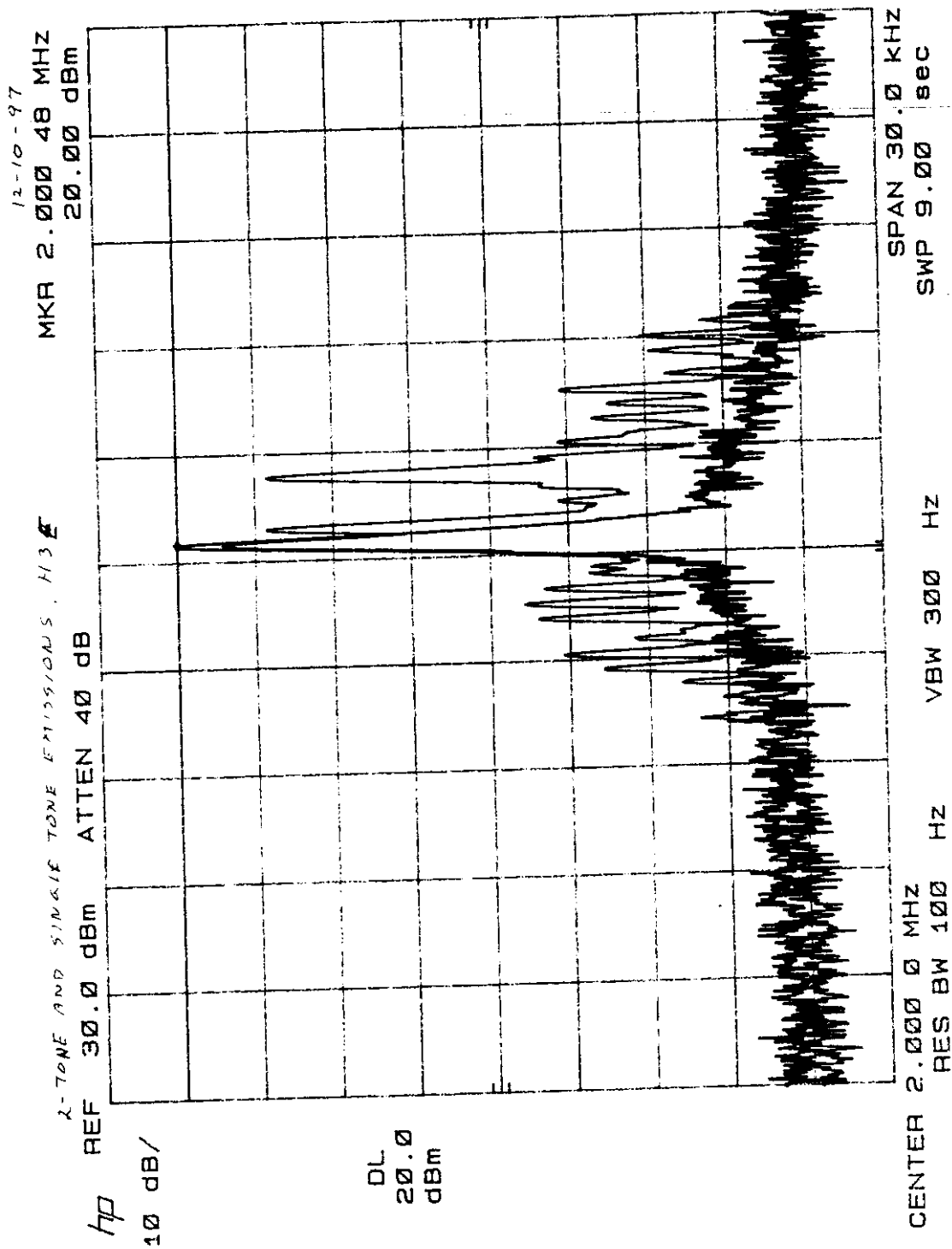
Electromagnetic Engineering Services, Inc.			11696 Sorrento Valley Road, Suite. F, San Diego, CA 92121 (619) 259-4940 Voice (619) 259-7170 Fax		
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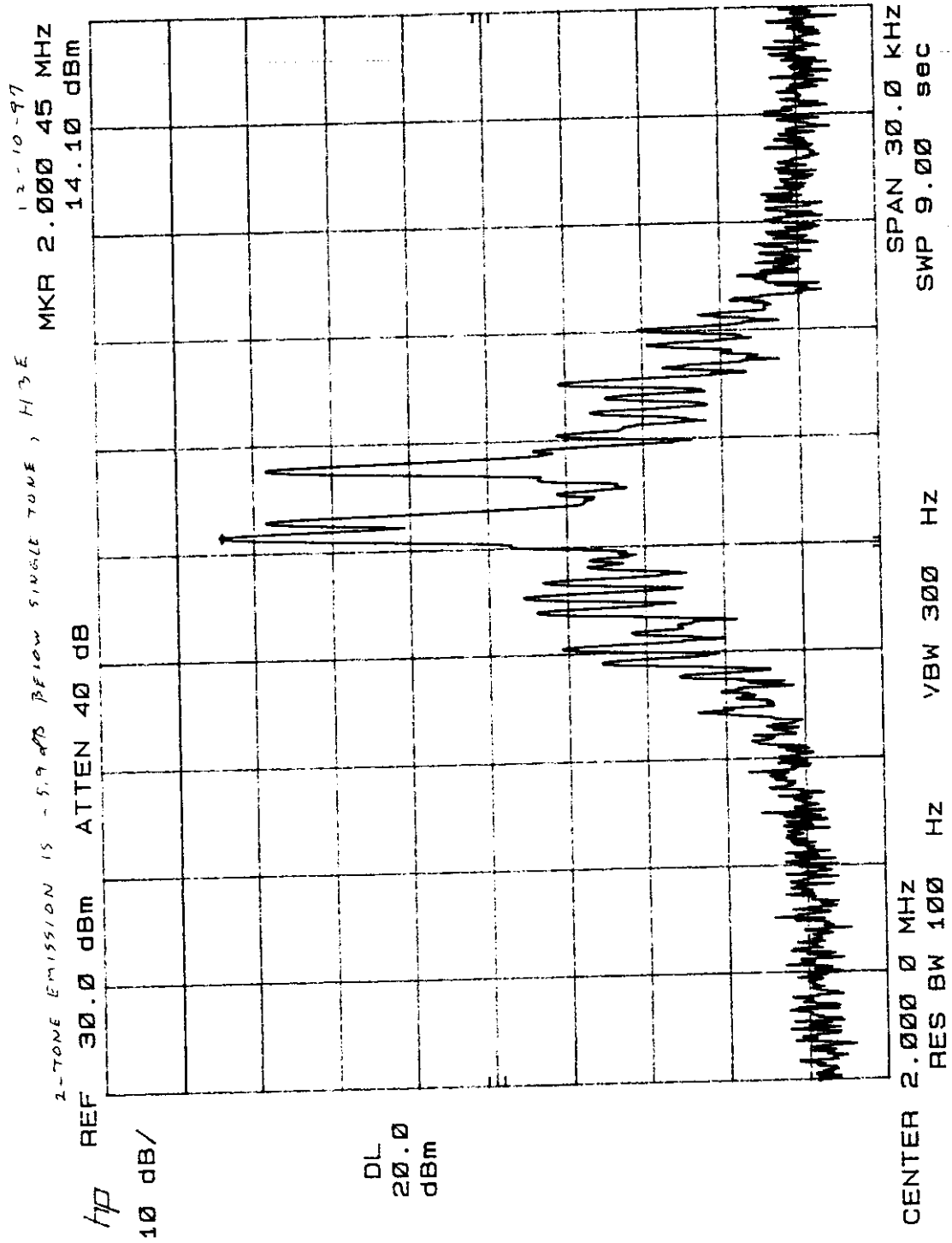
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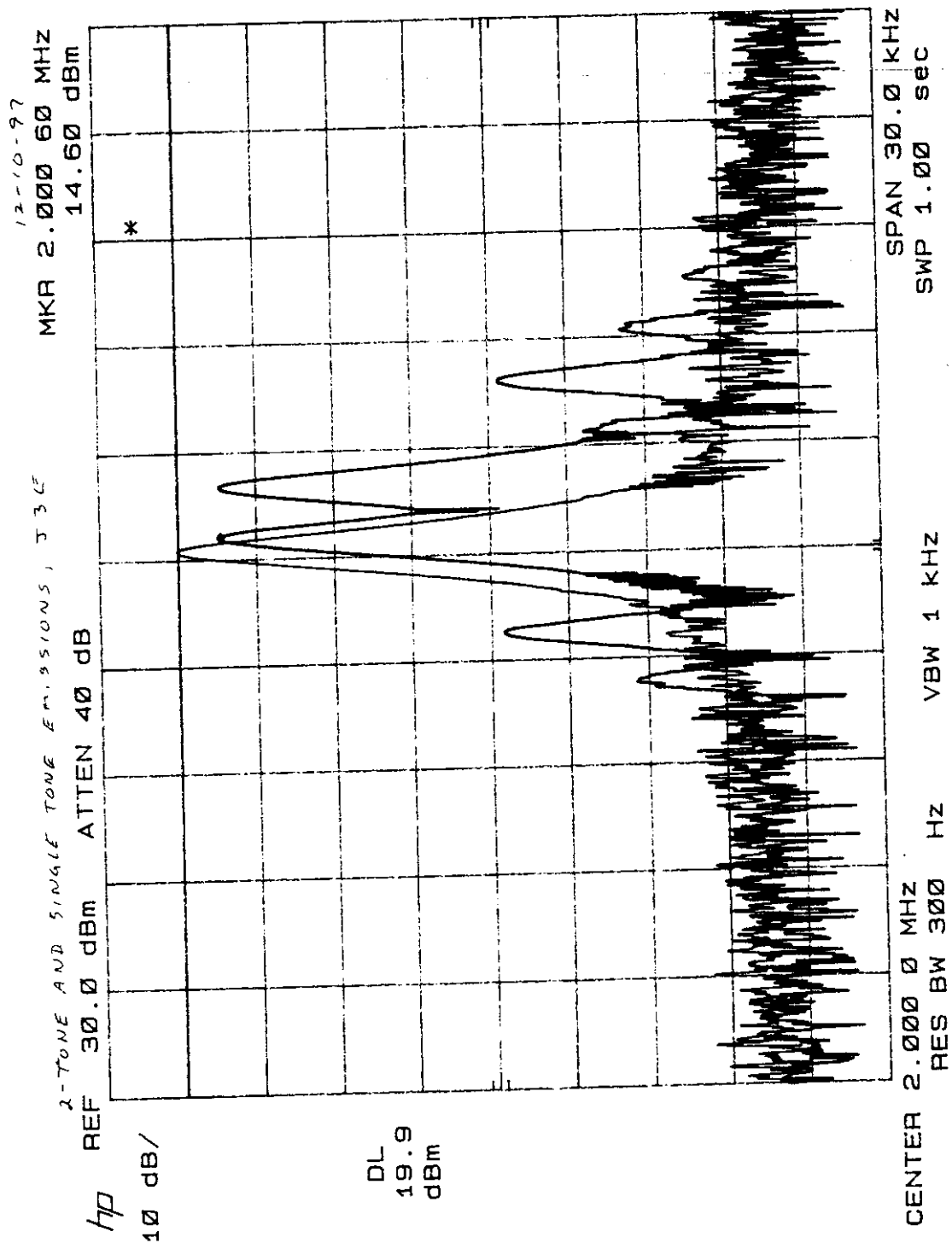
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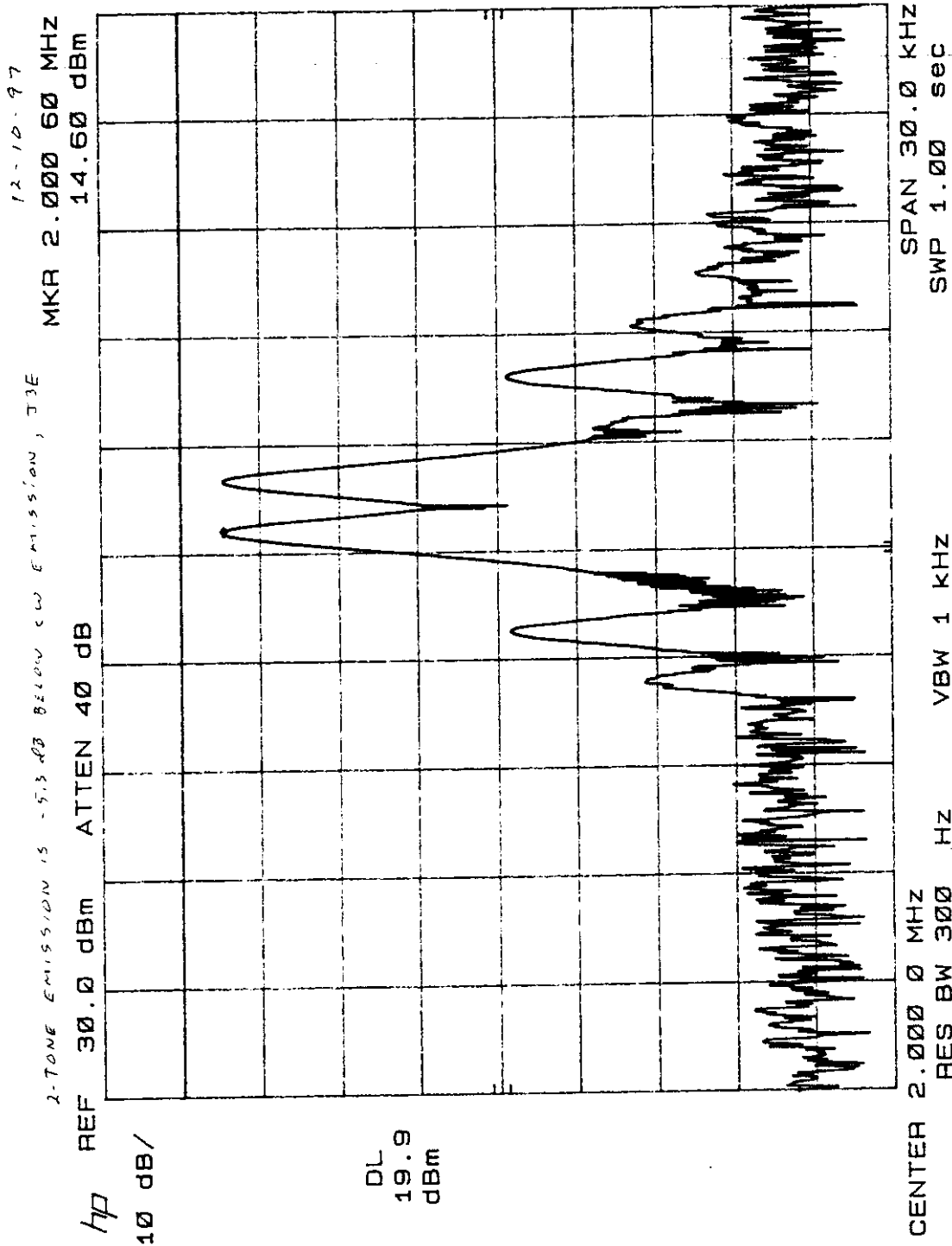
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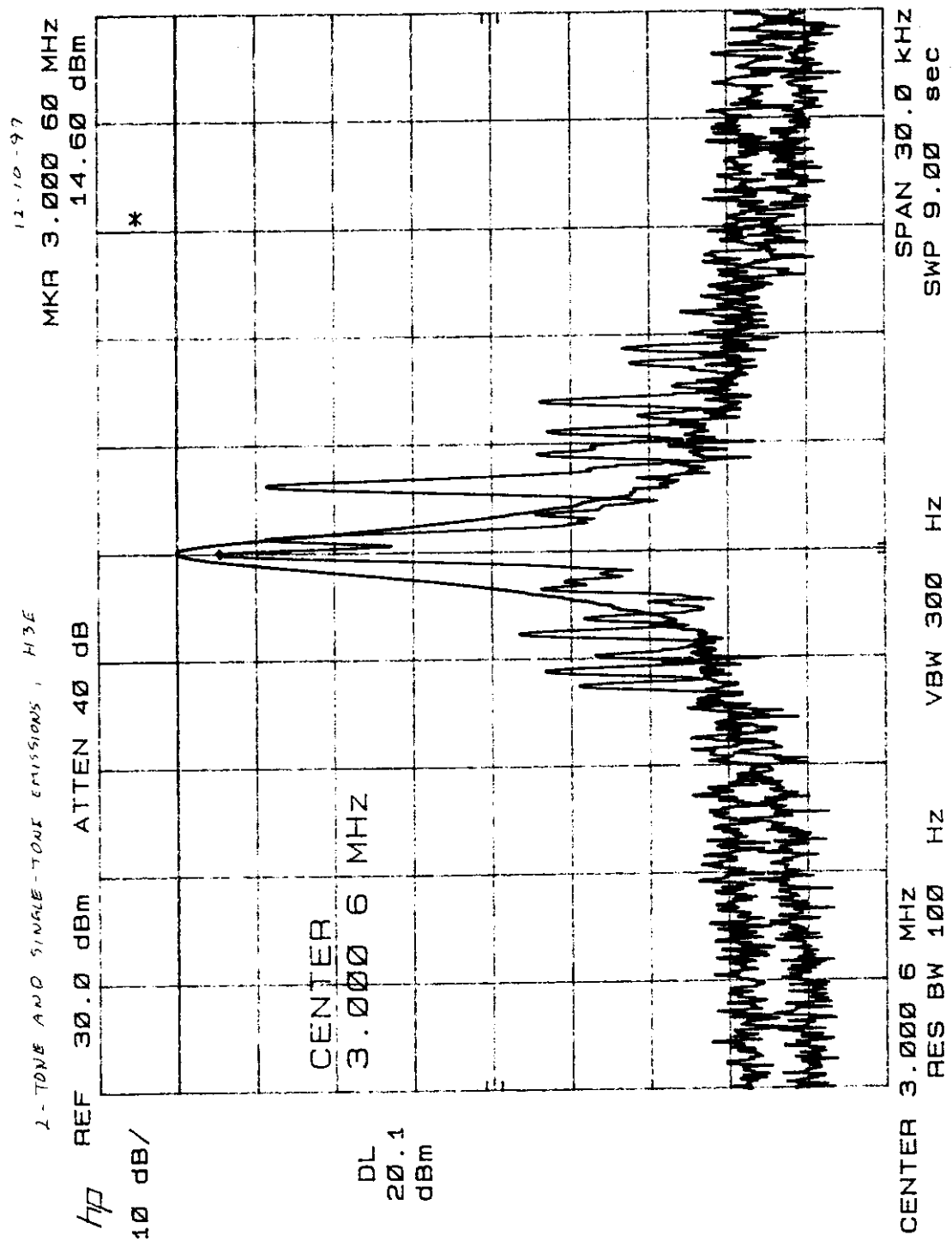
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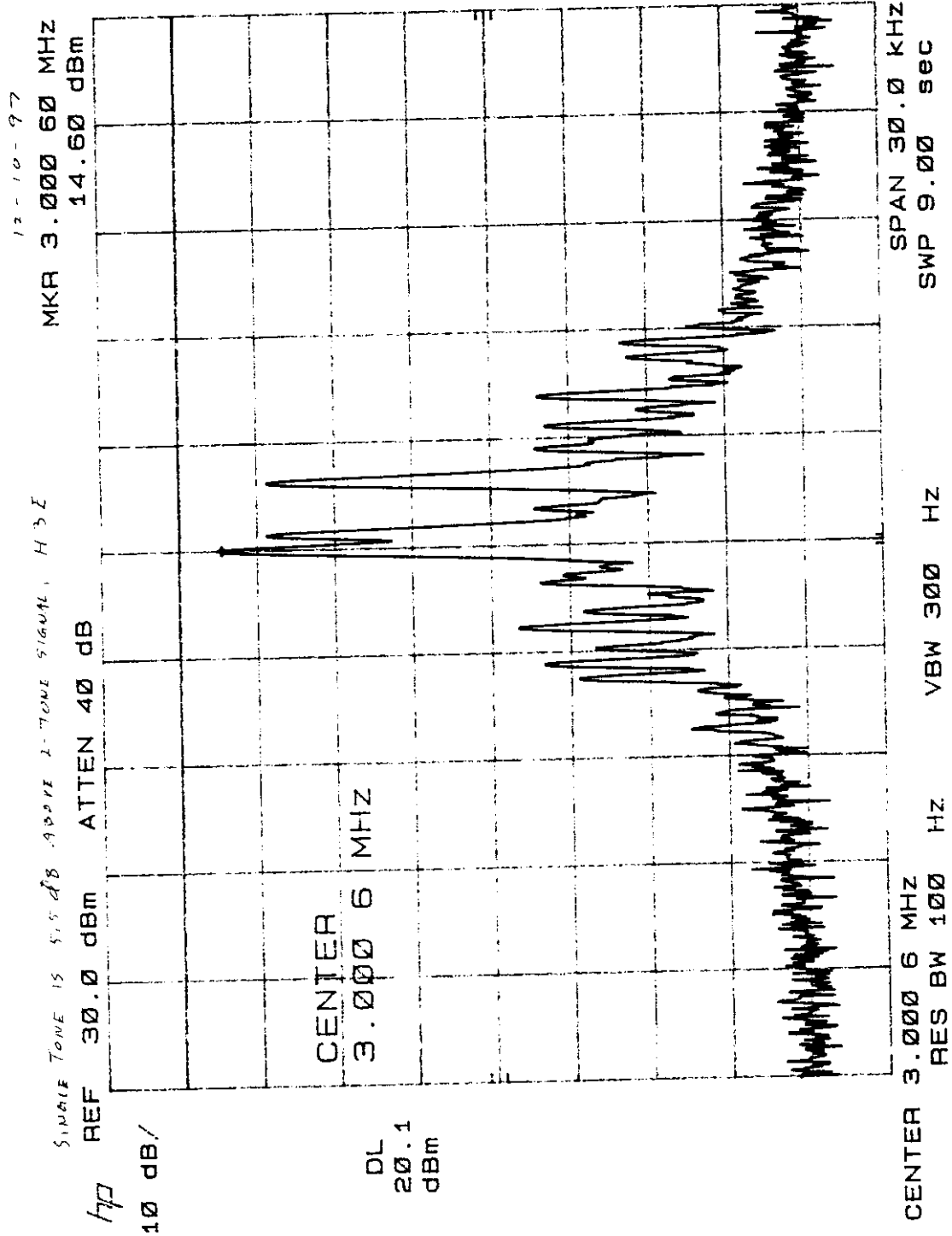
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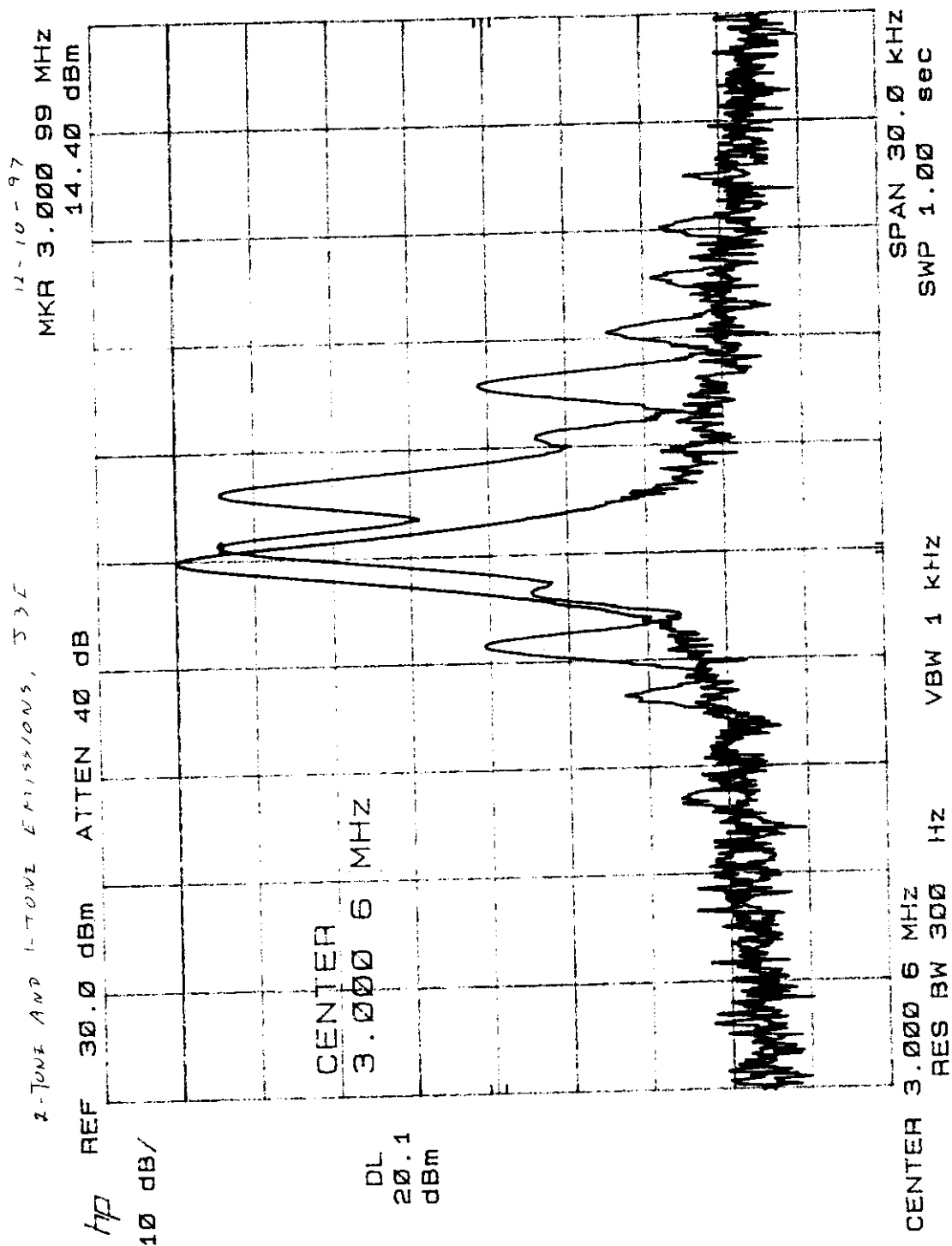
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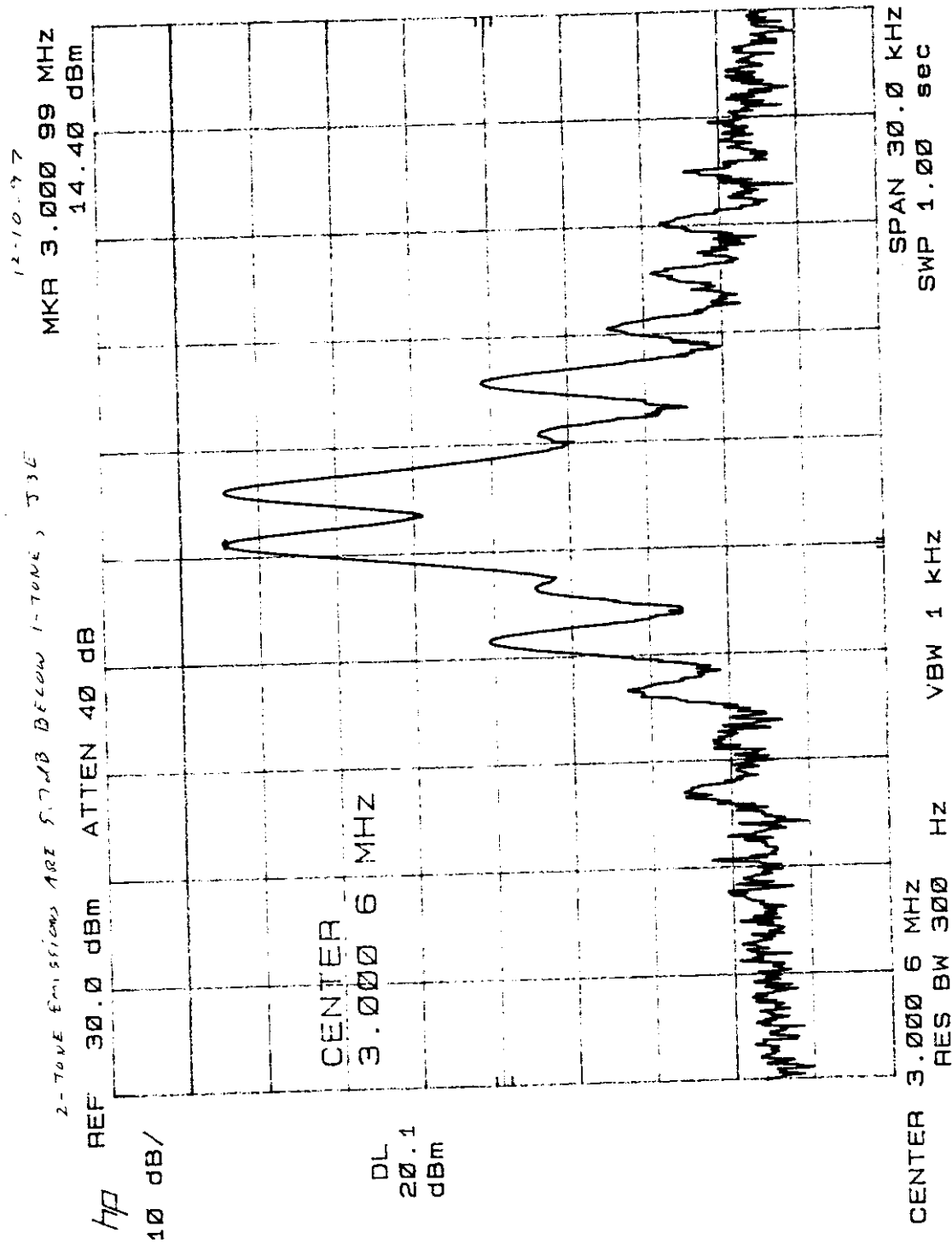
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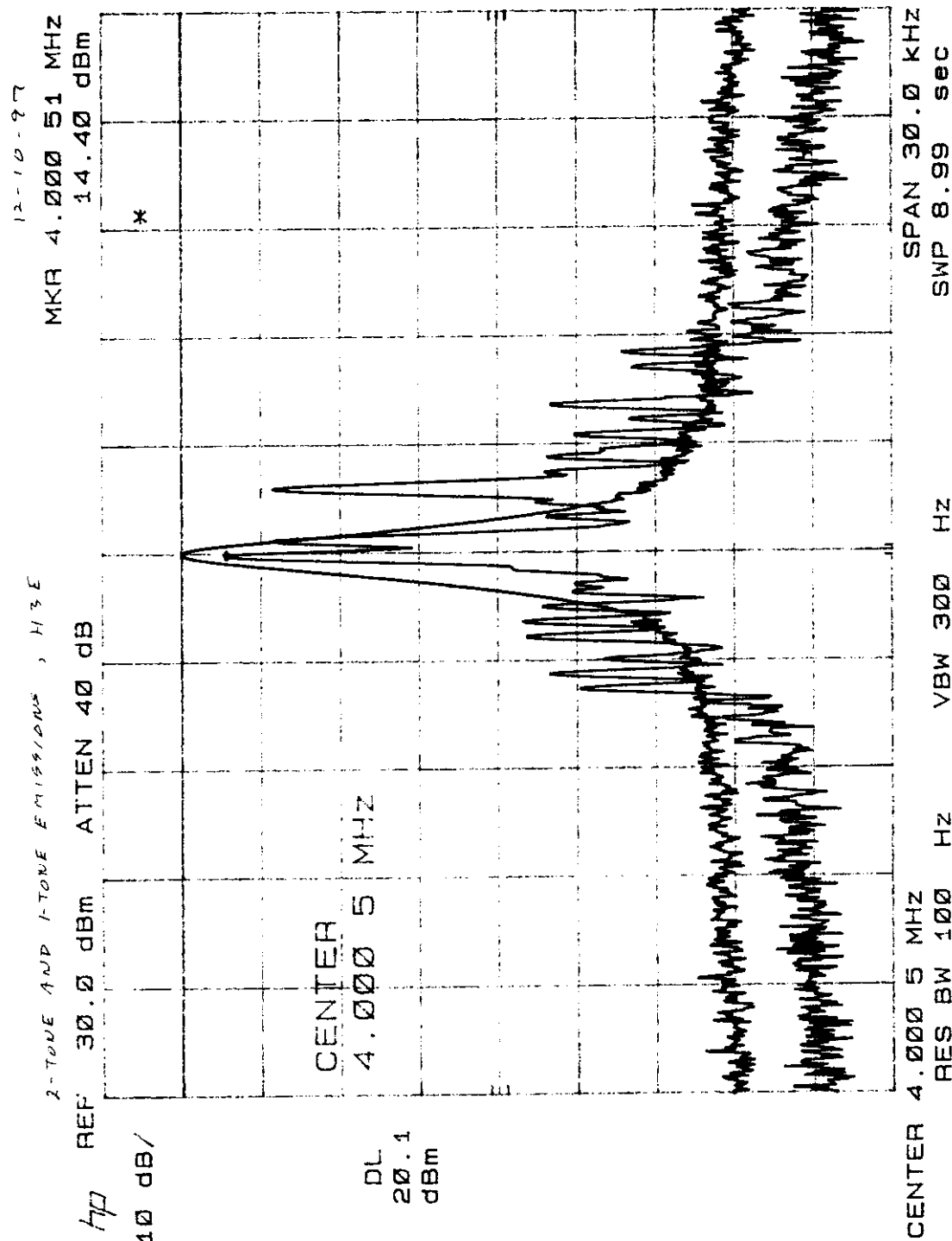
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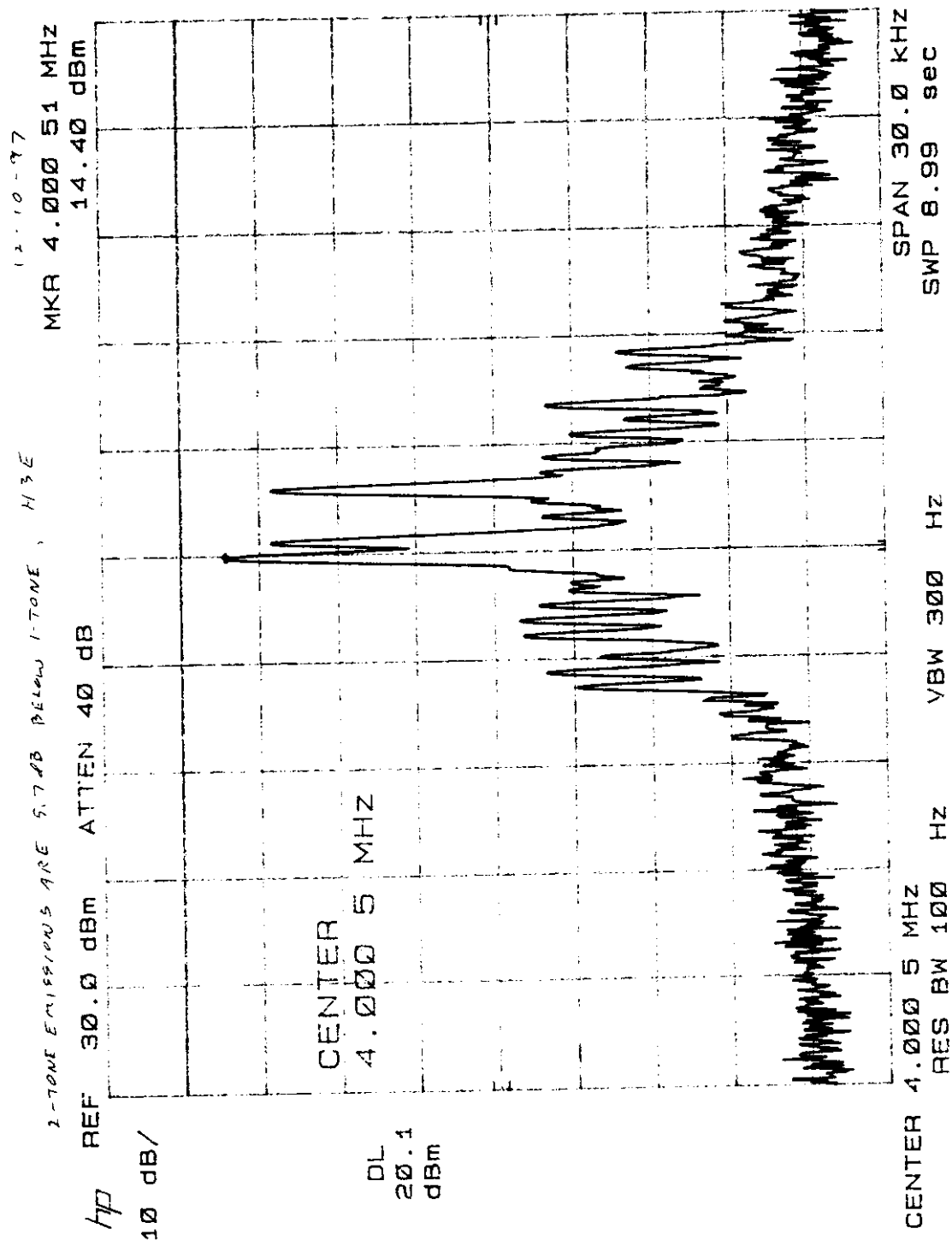
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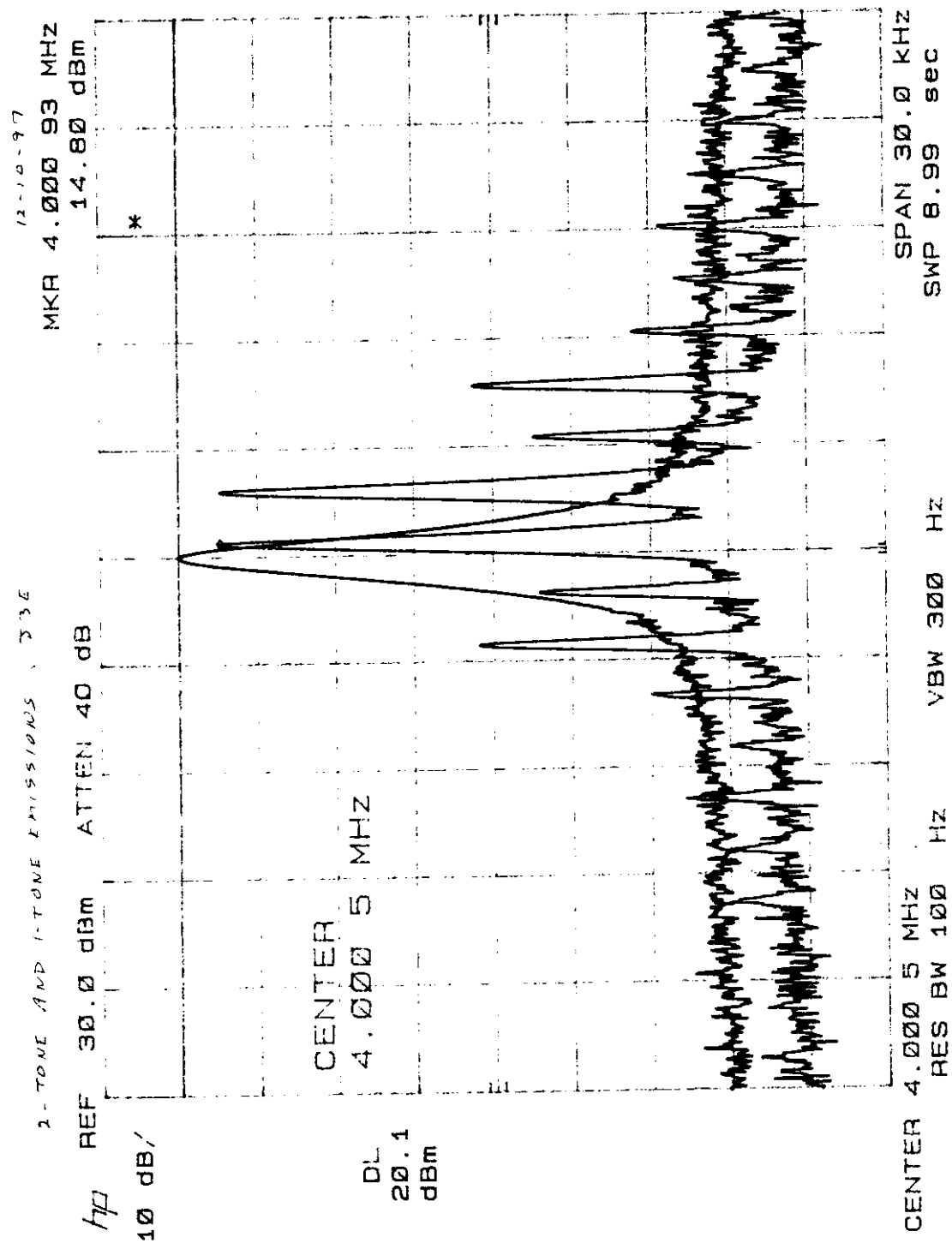


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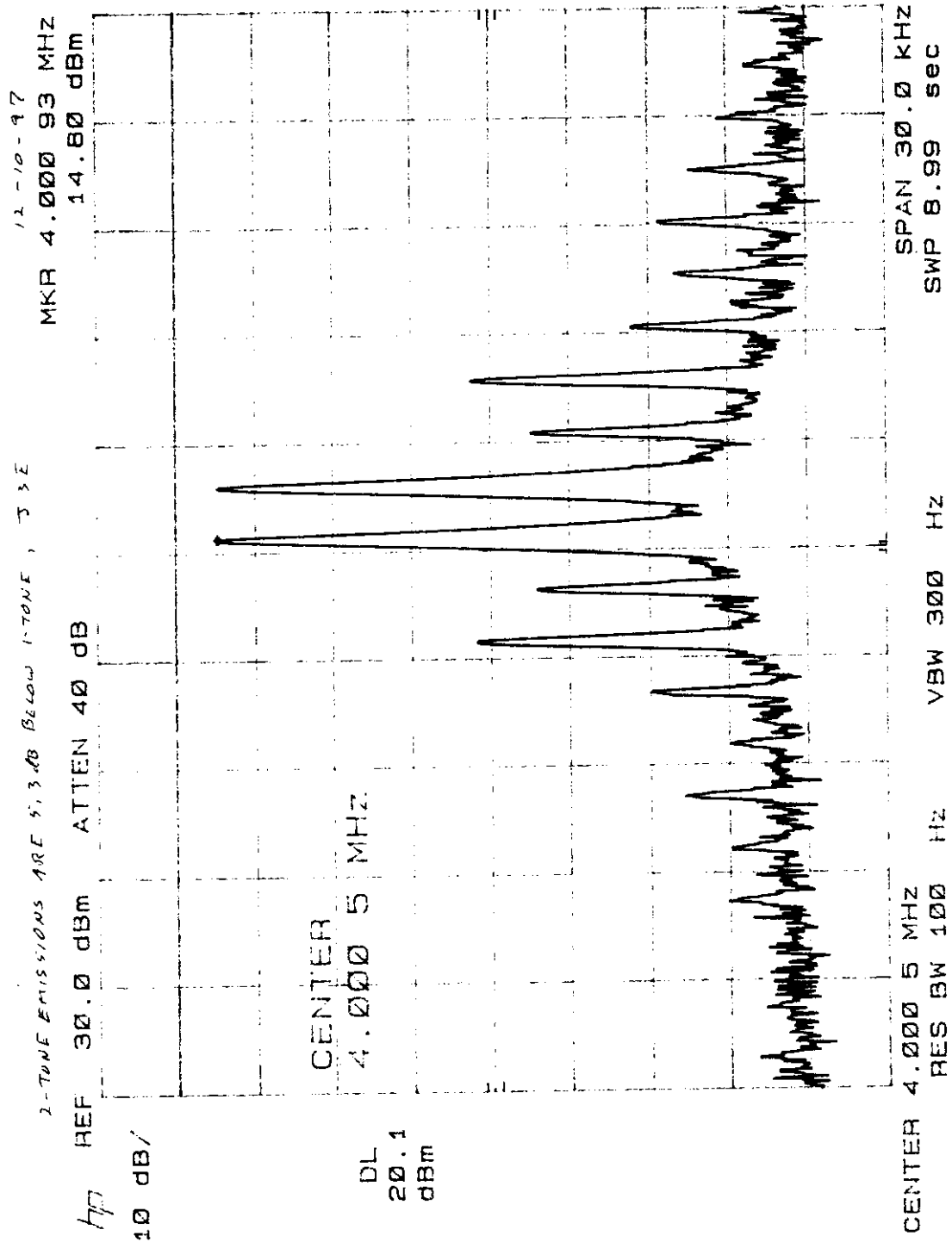


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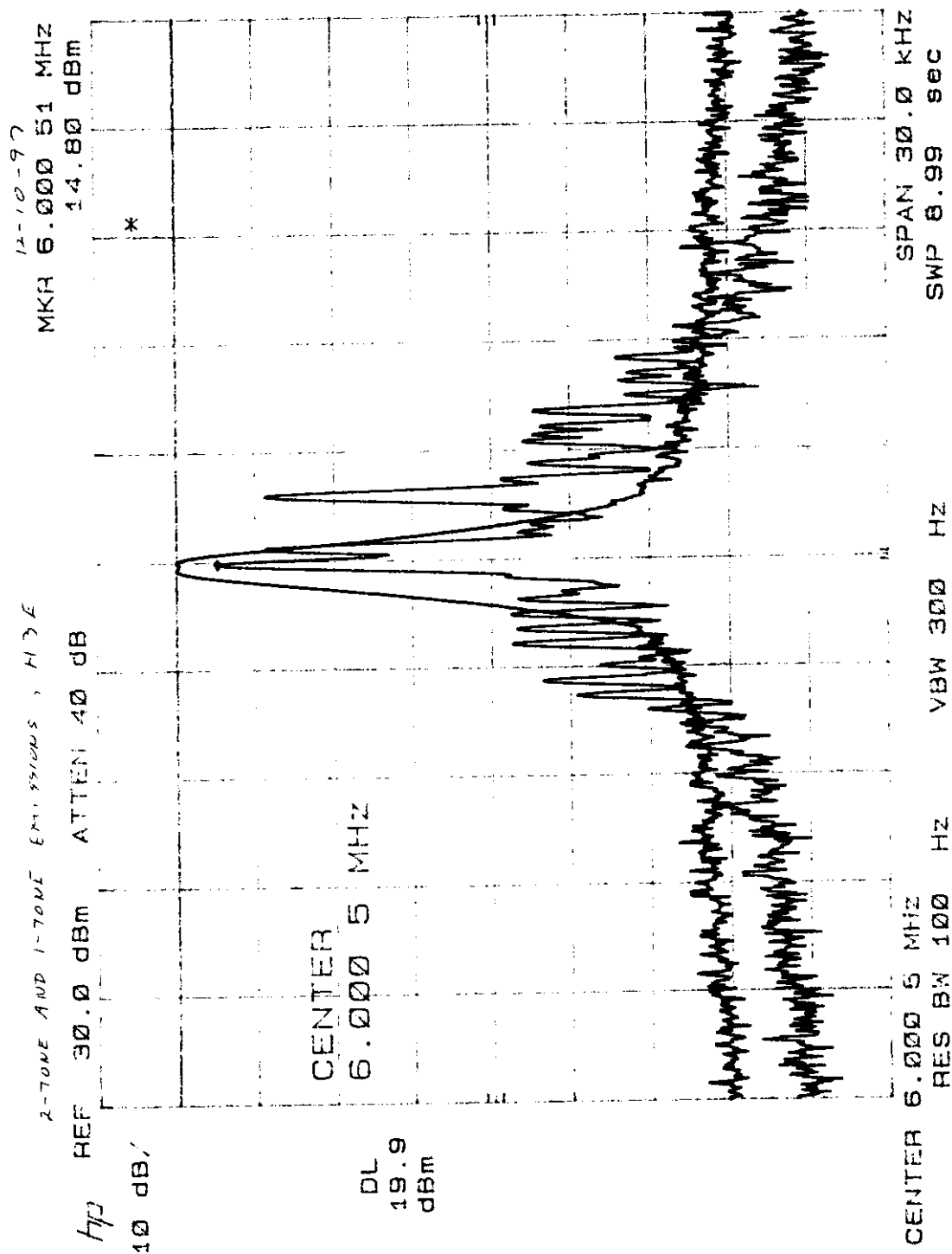




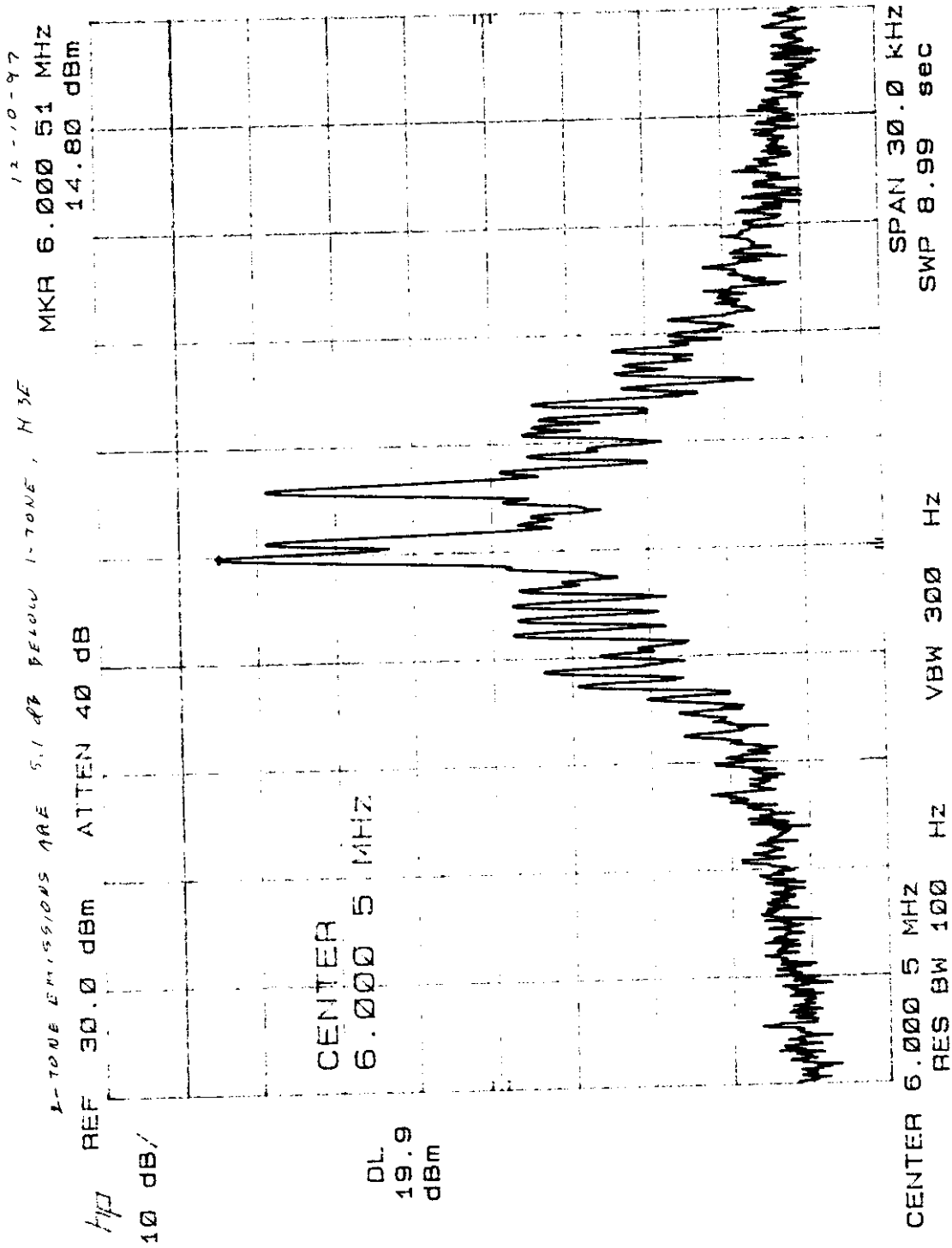
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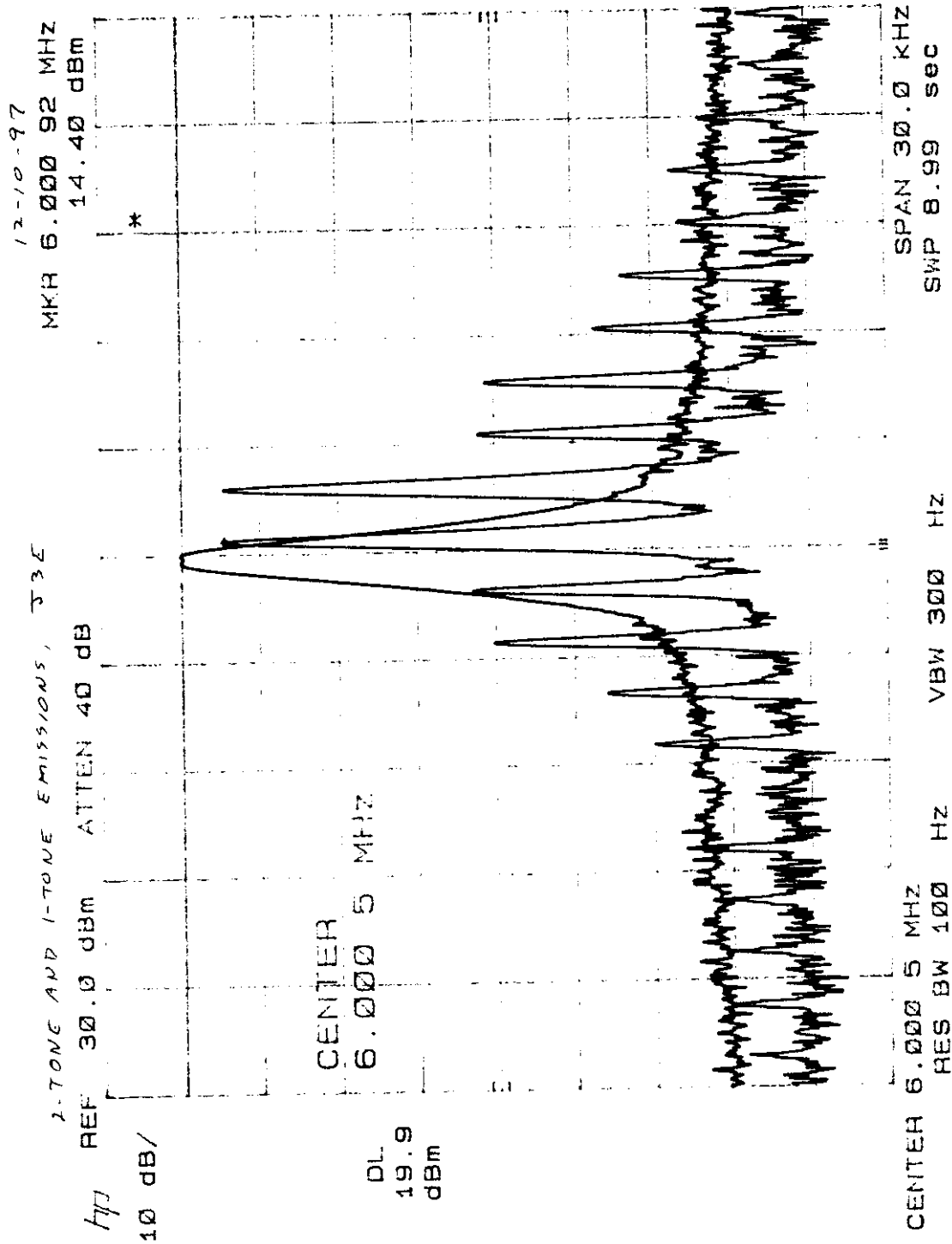
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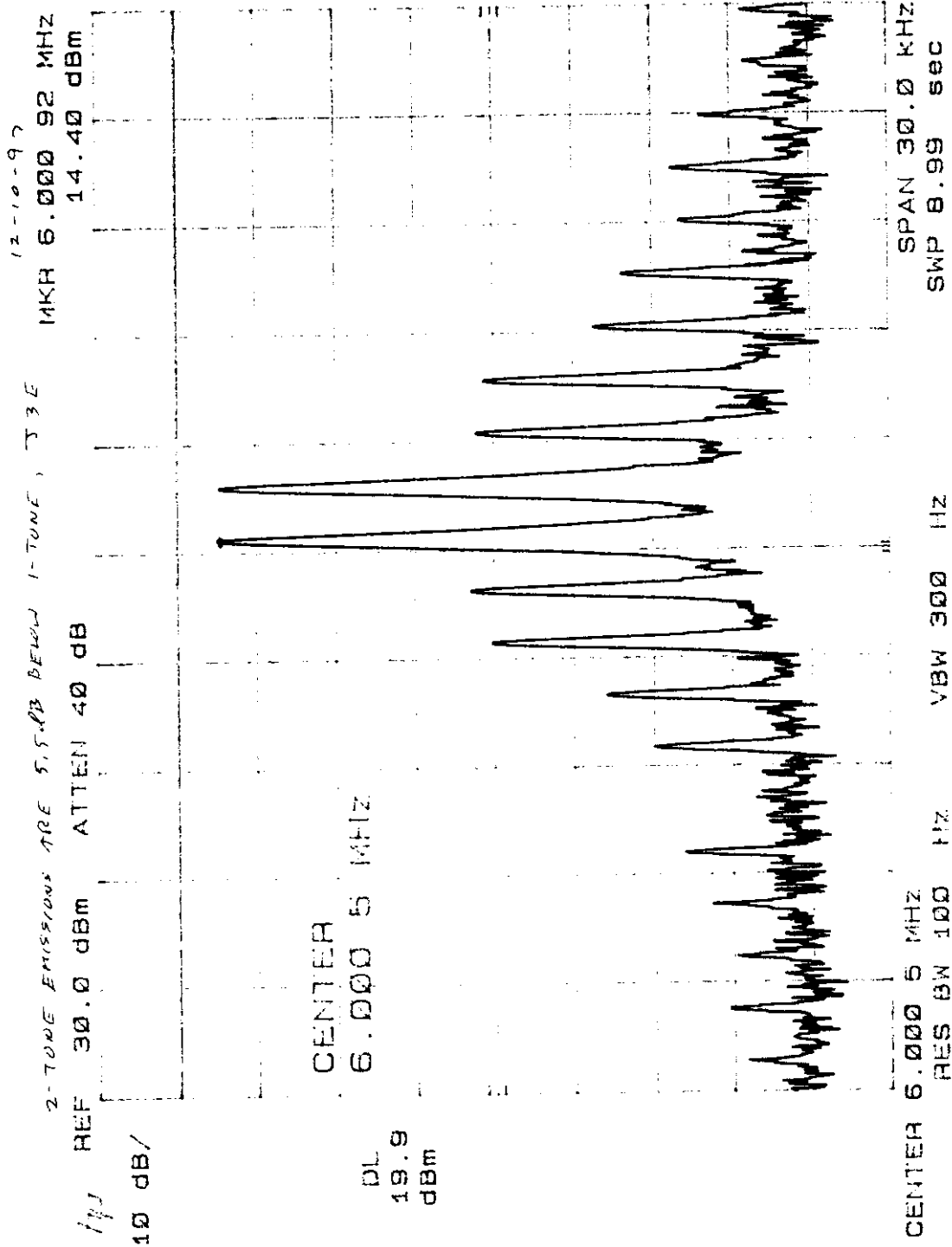
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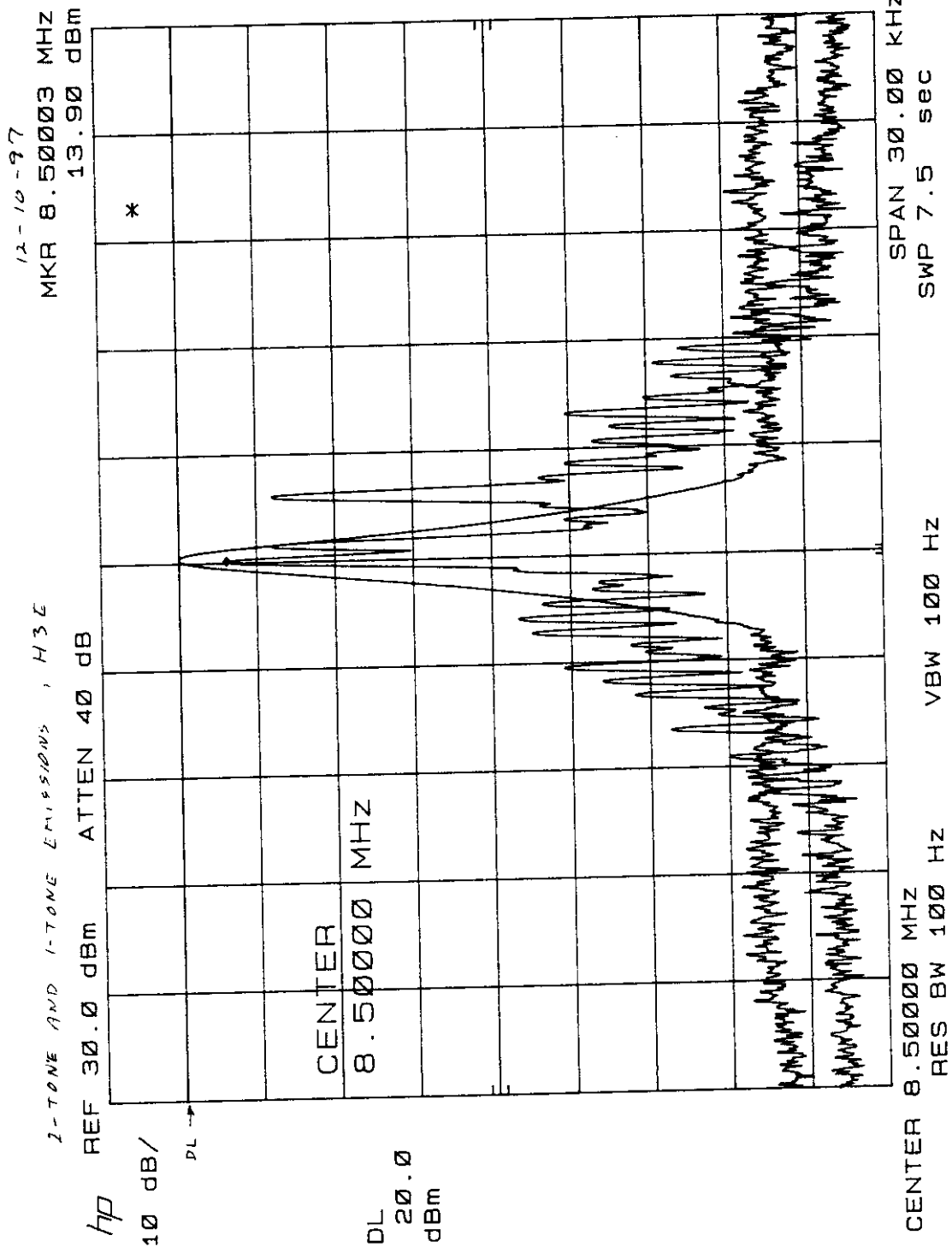
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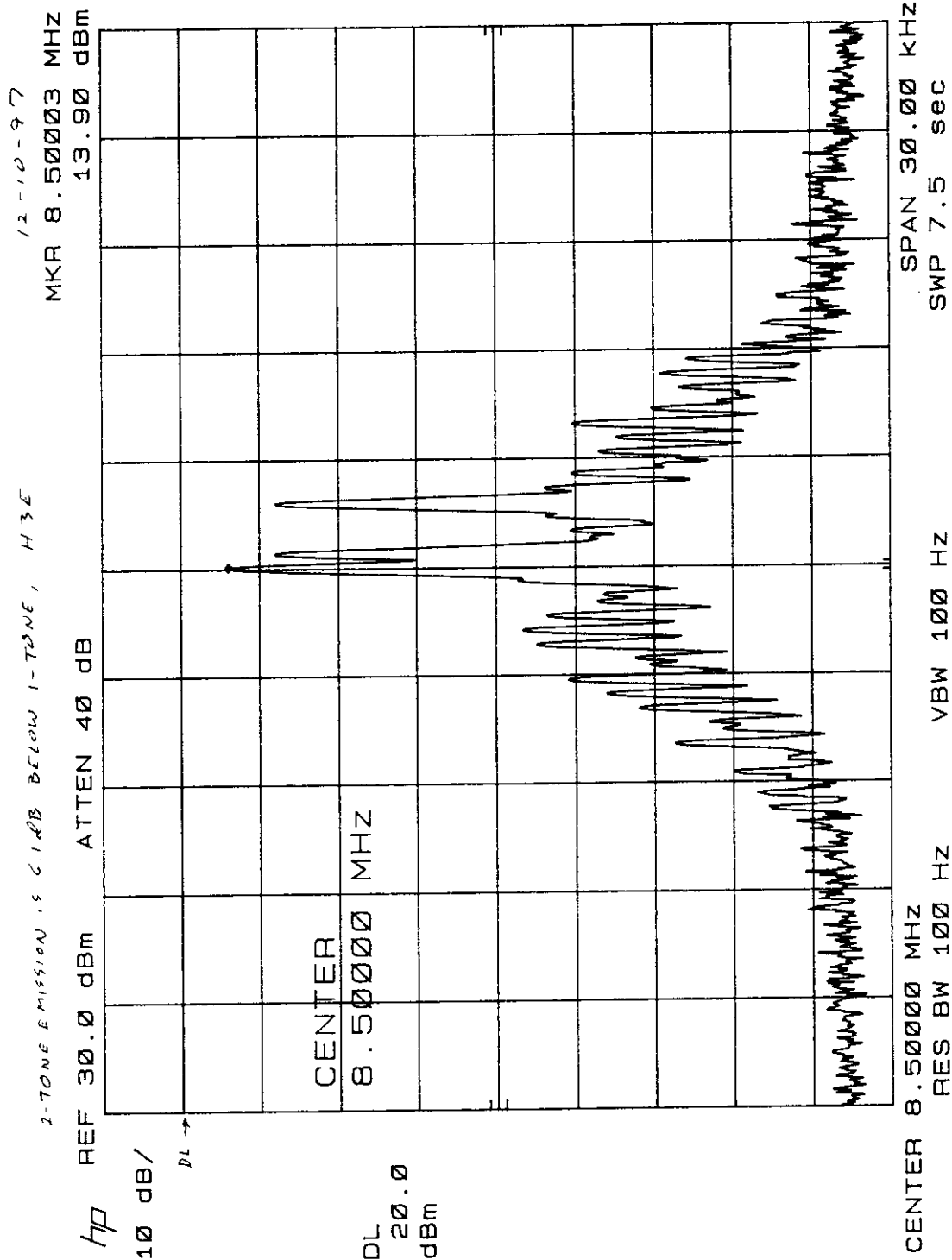
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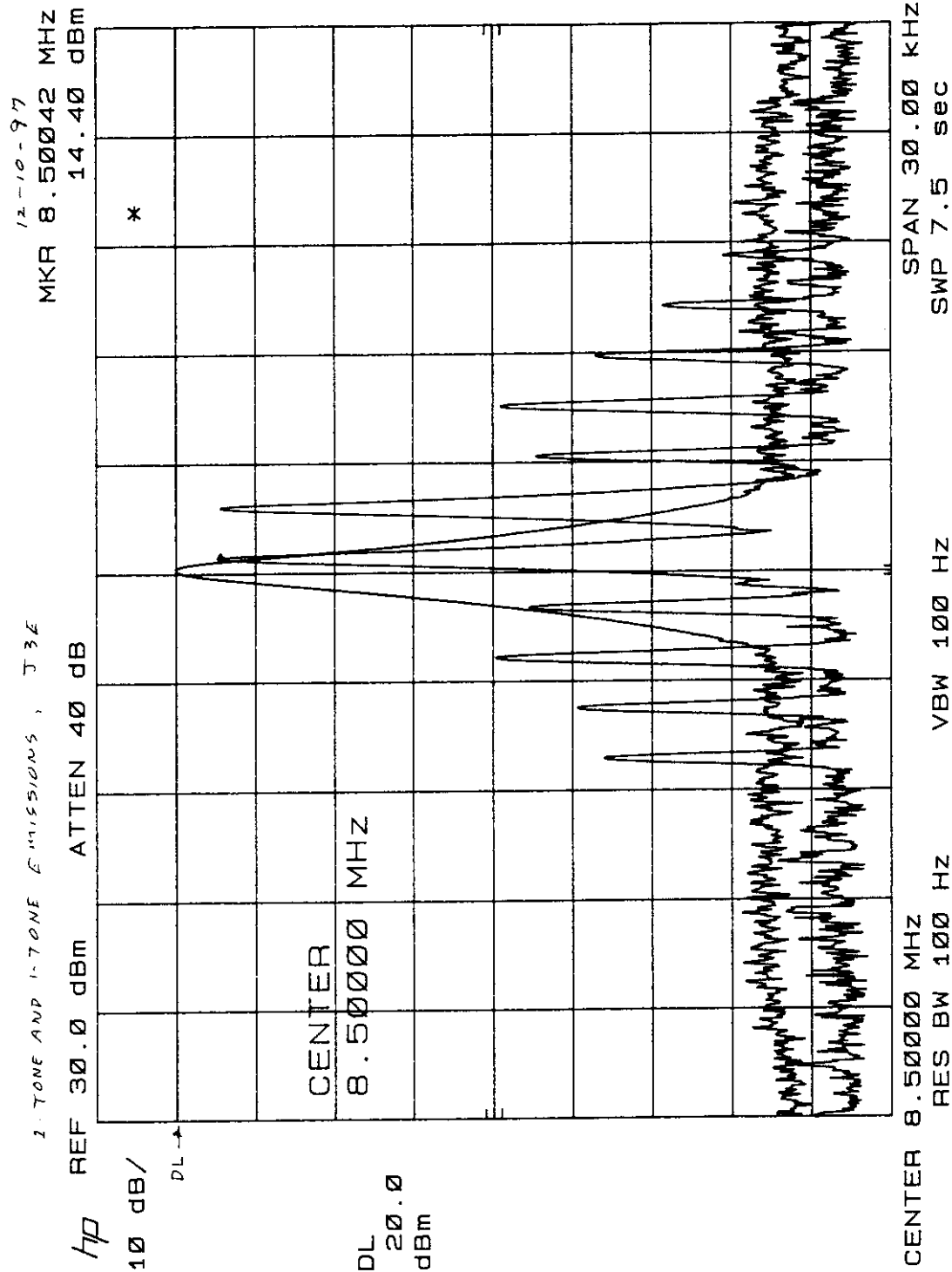
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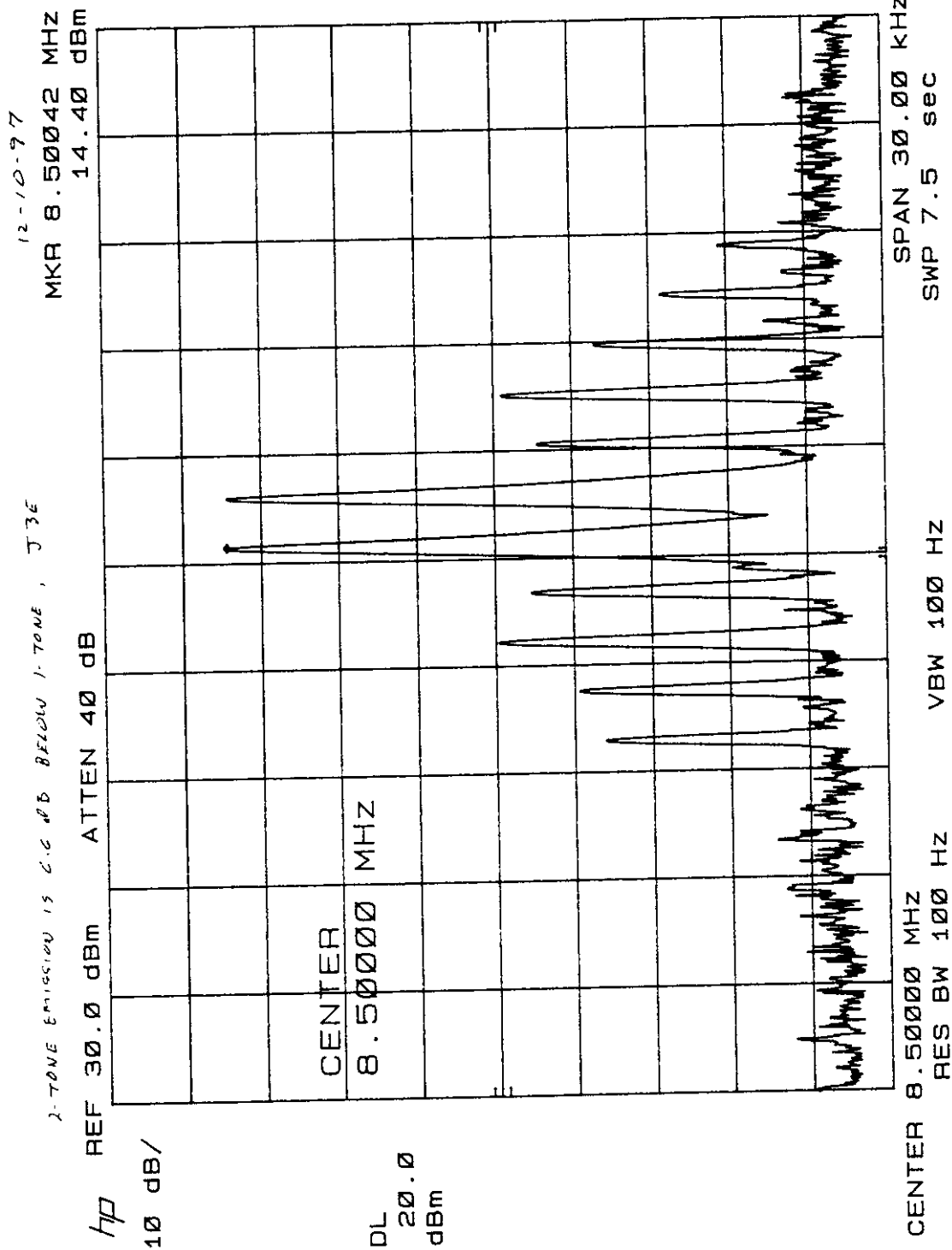
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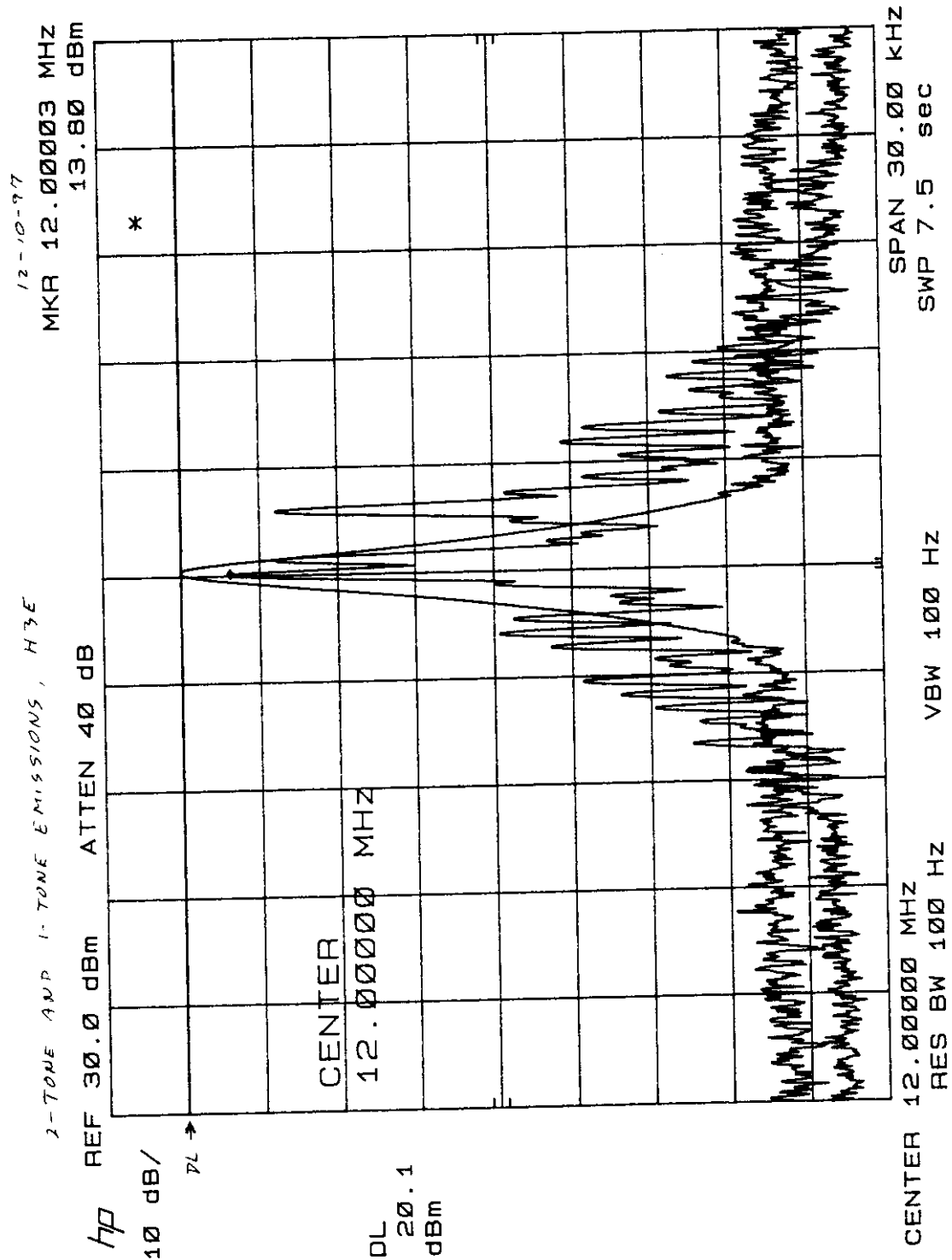
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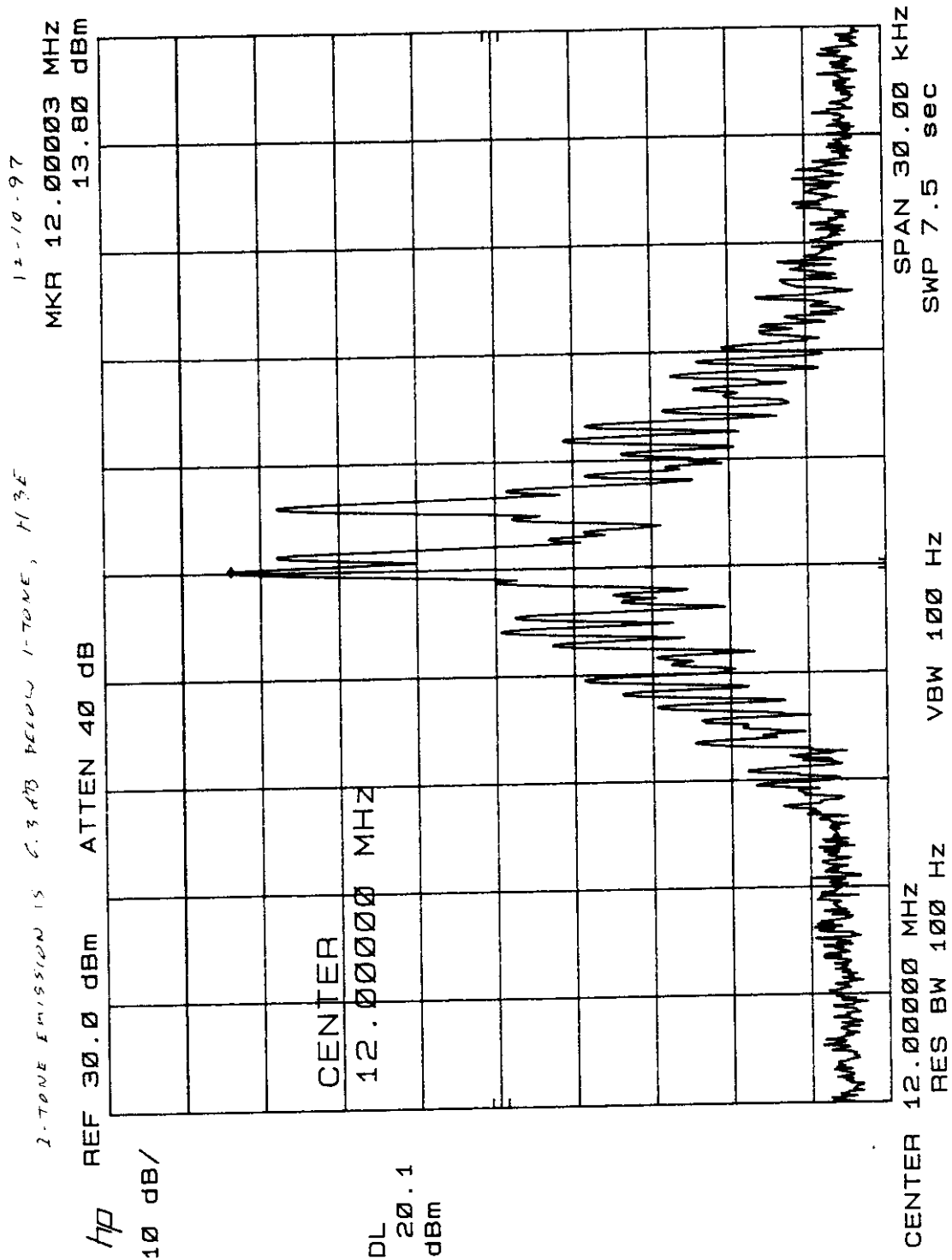
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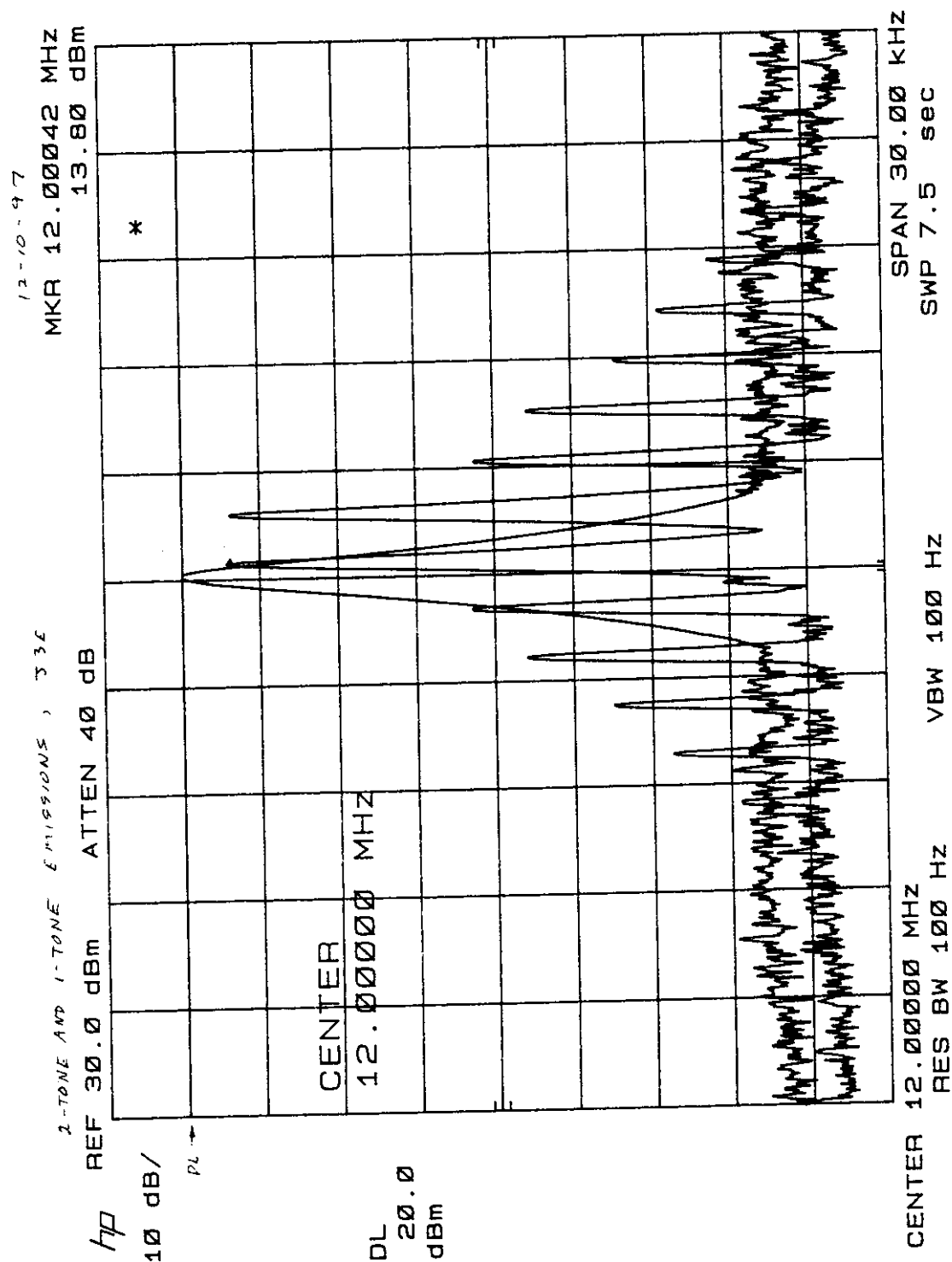
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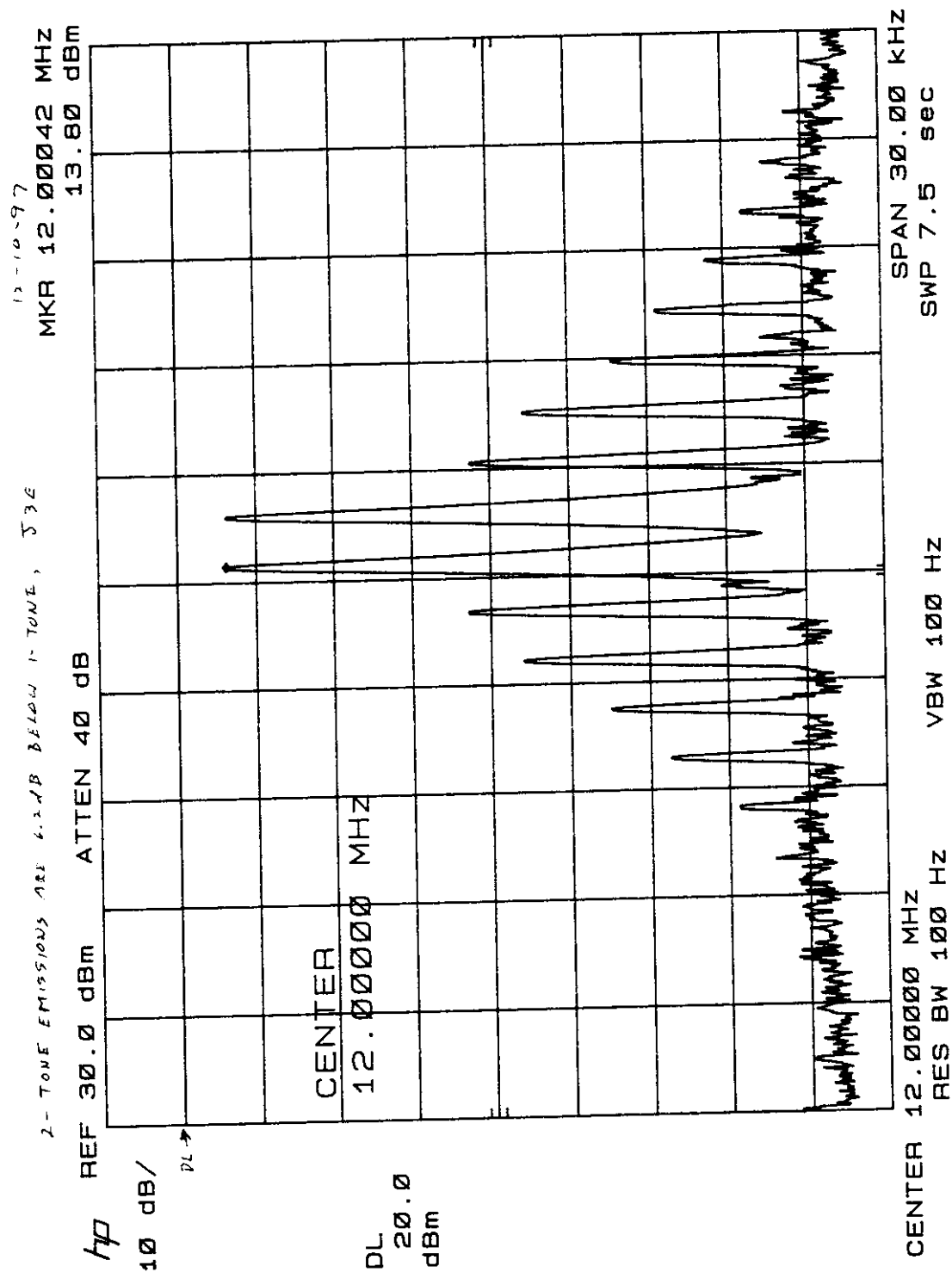
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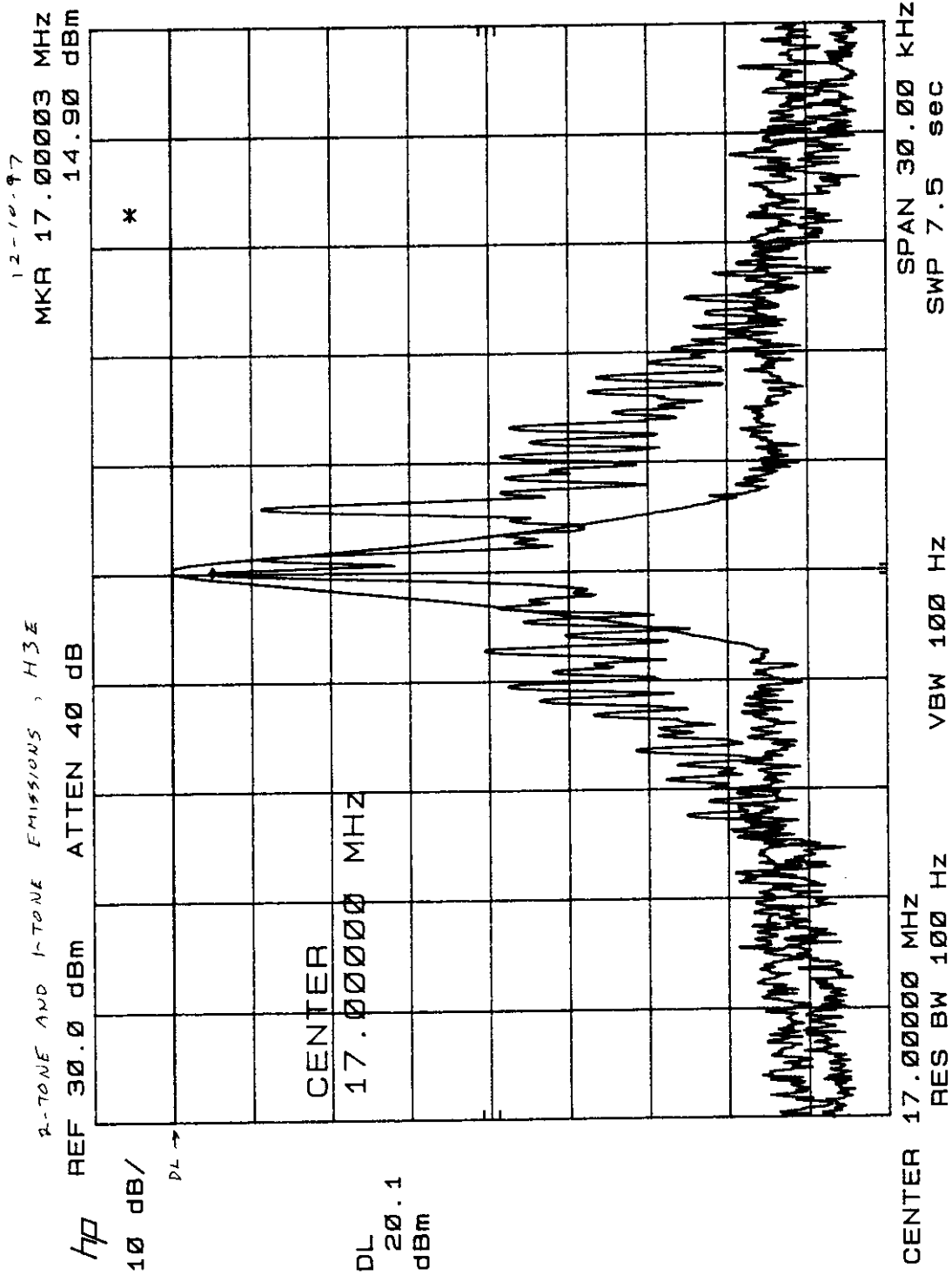
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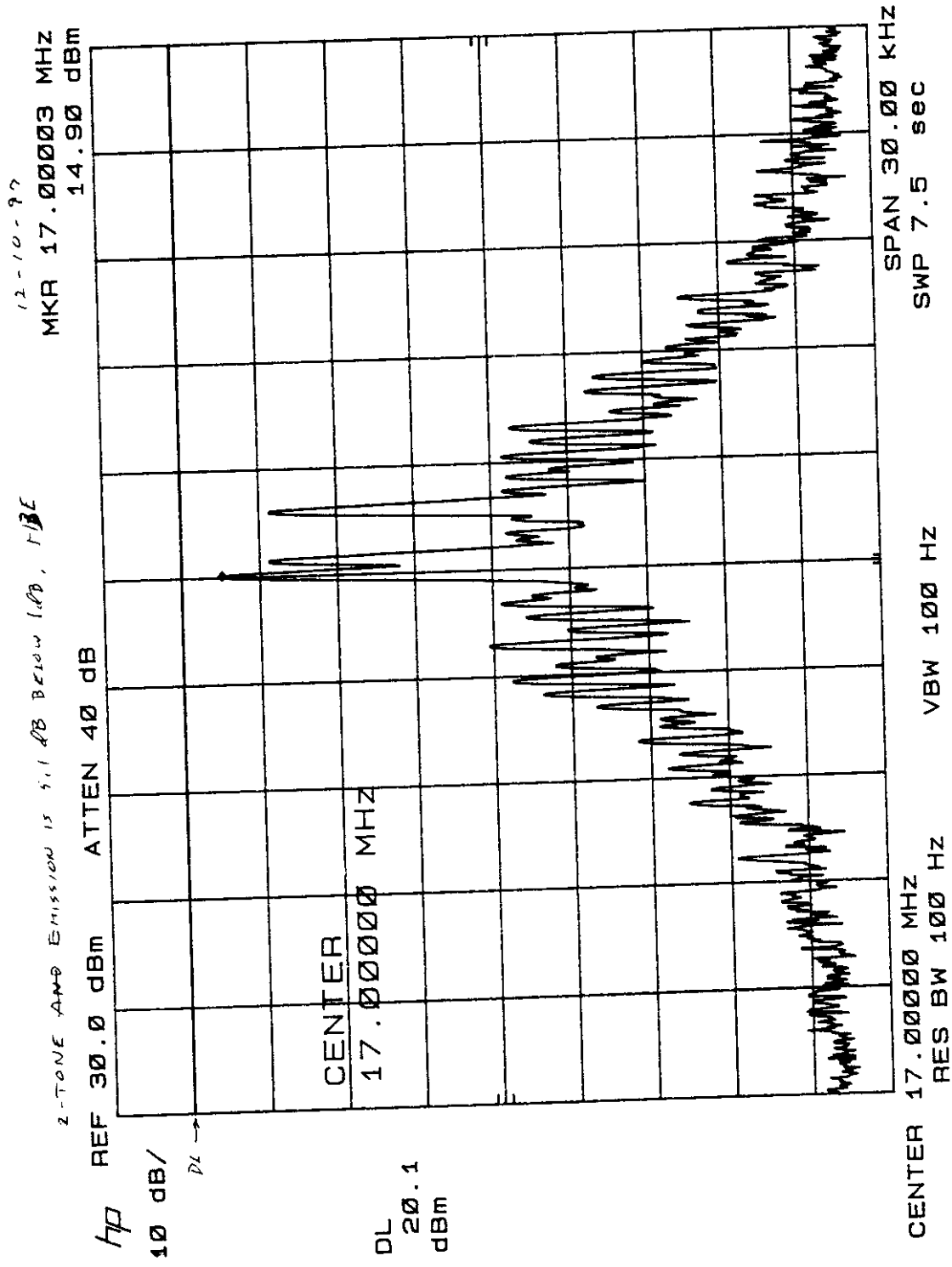
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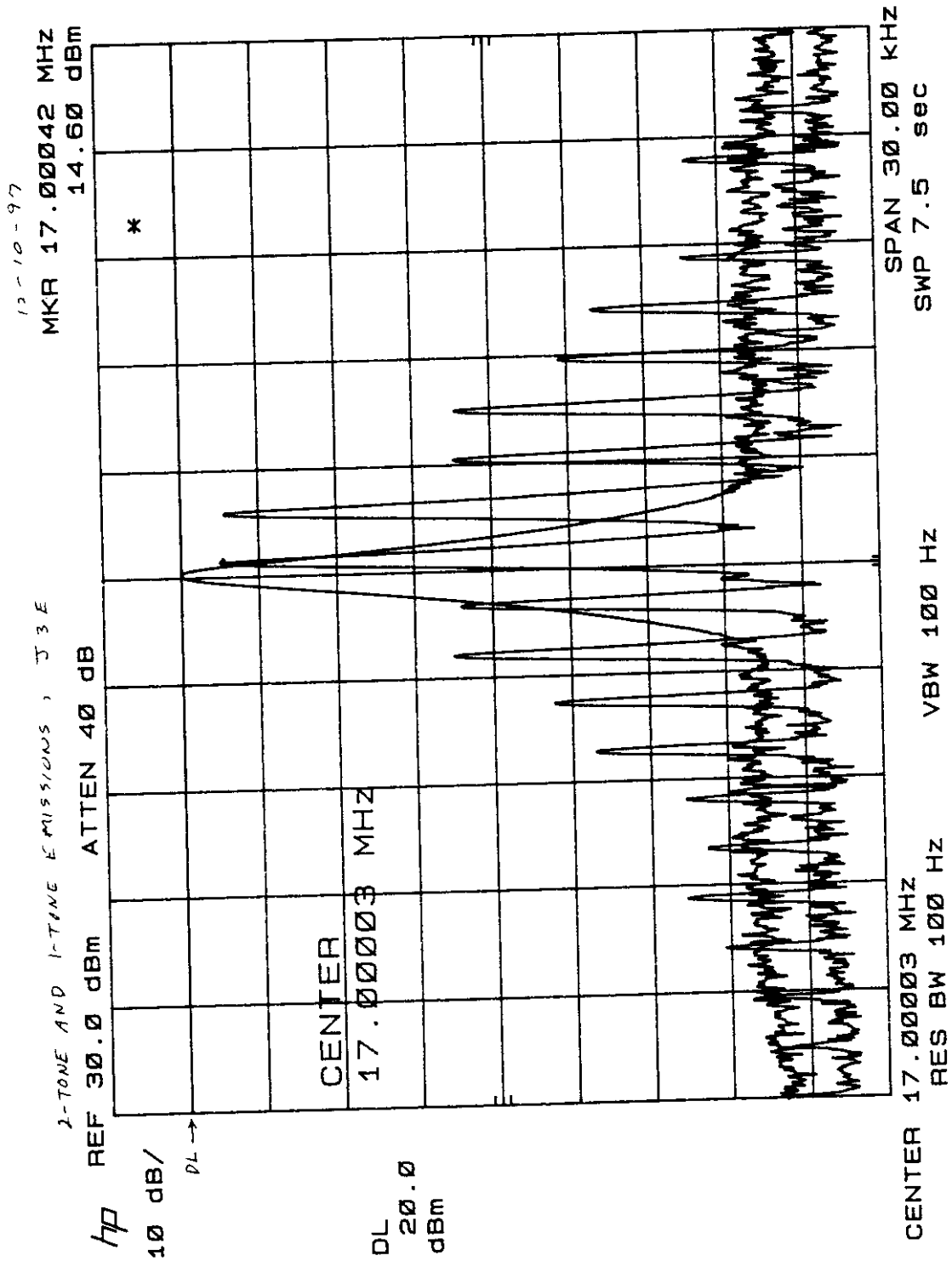
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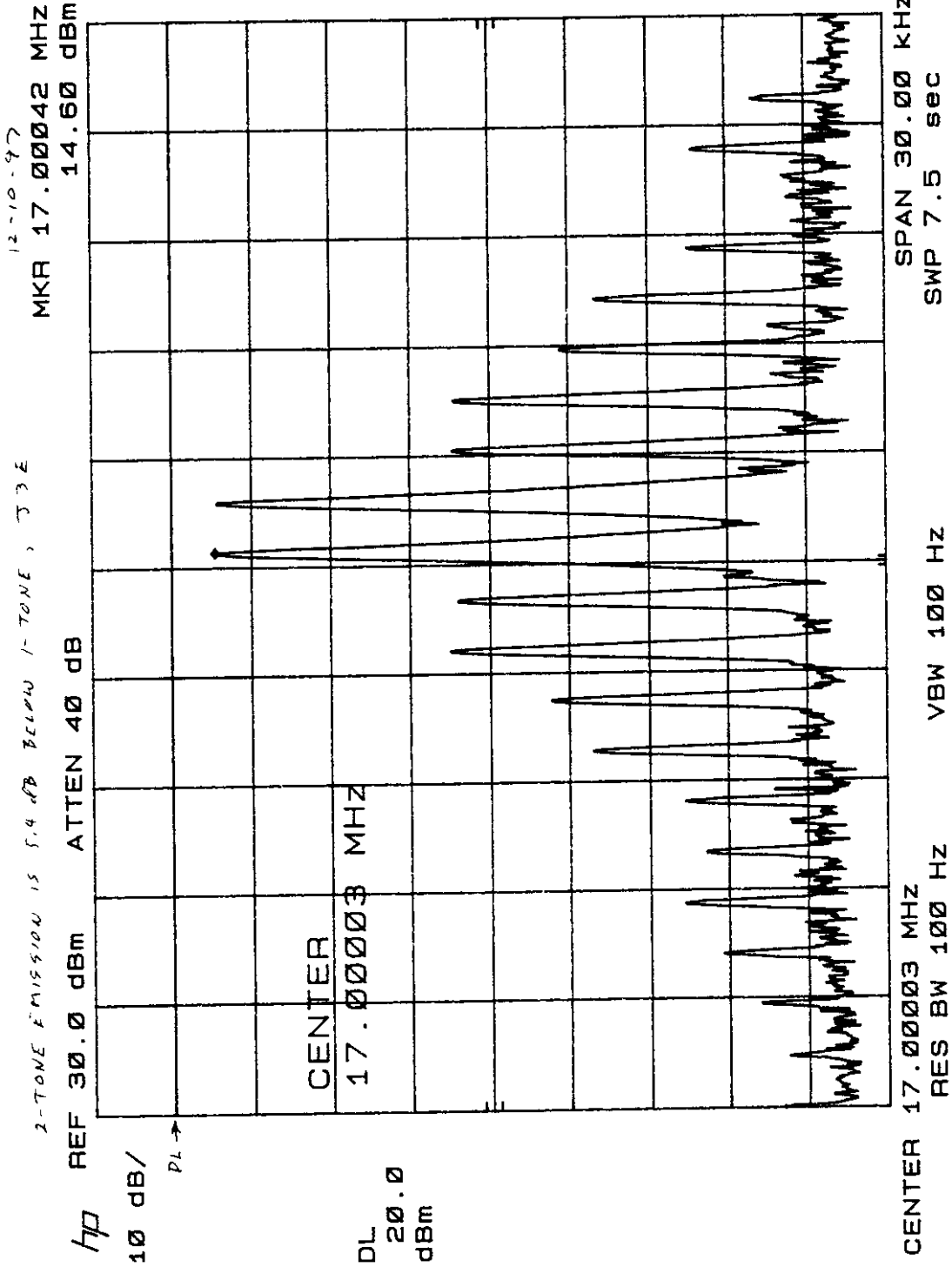
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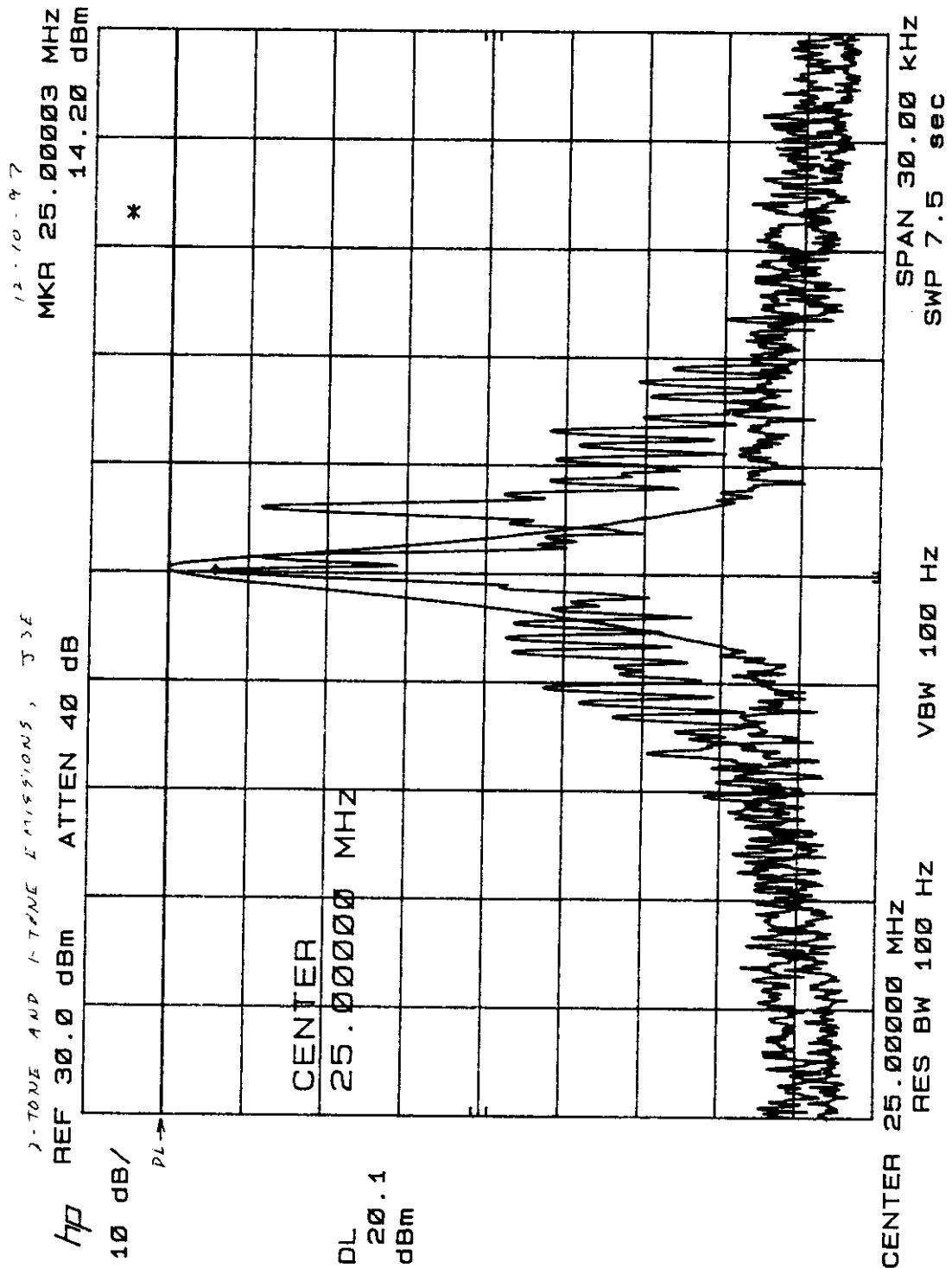


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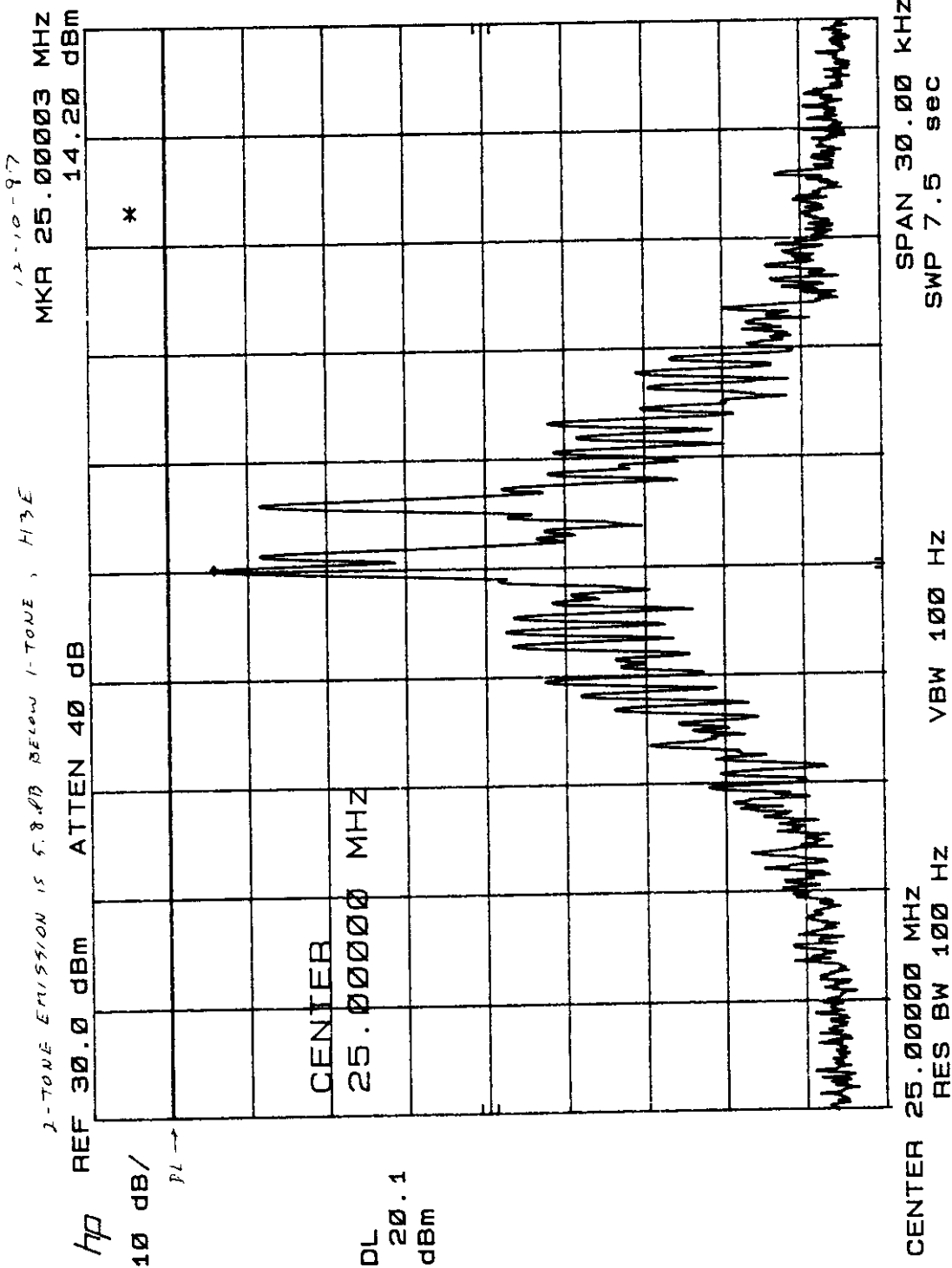




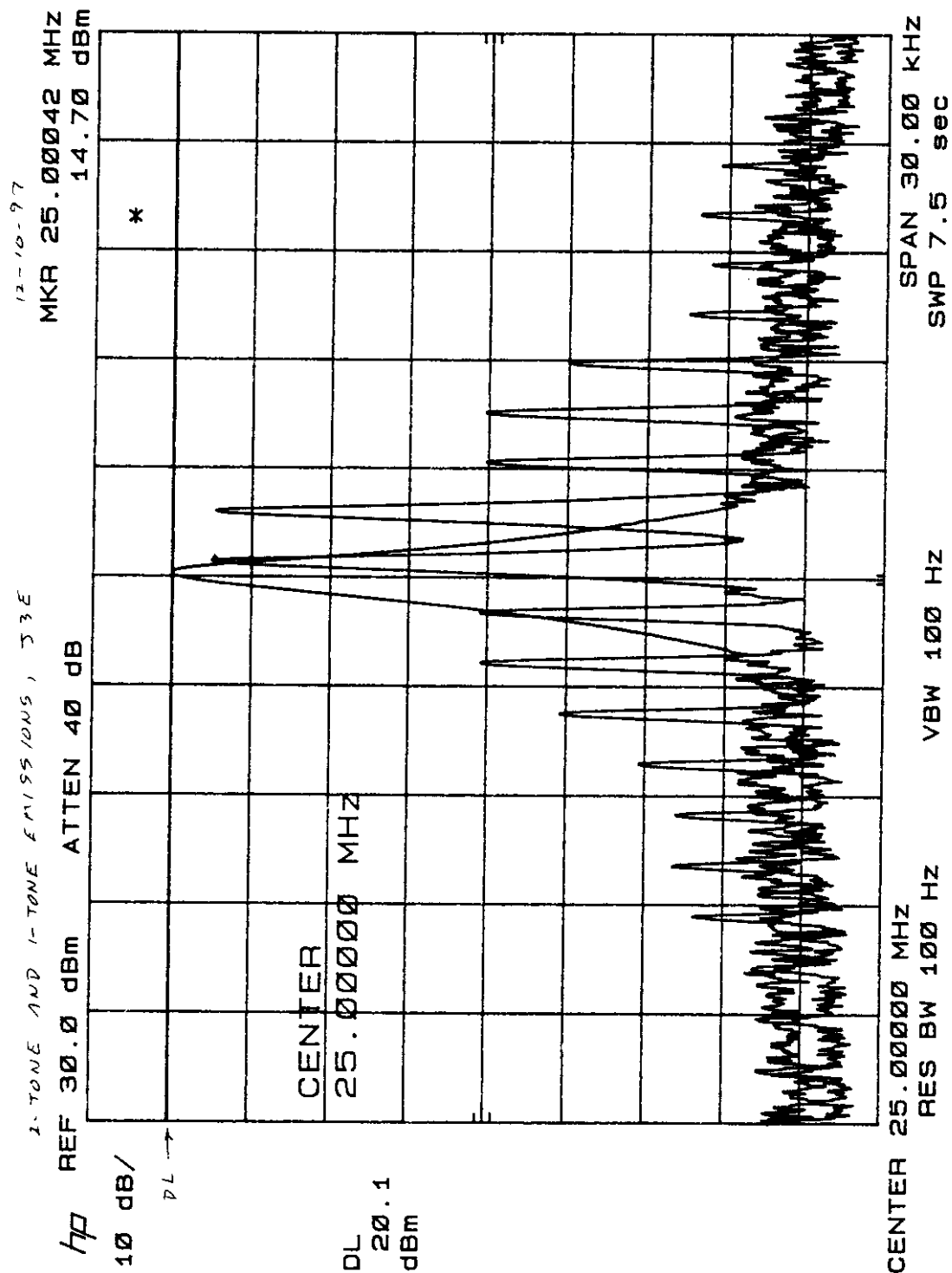
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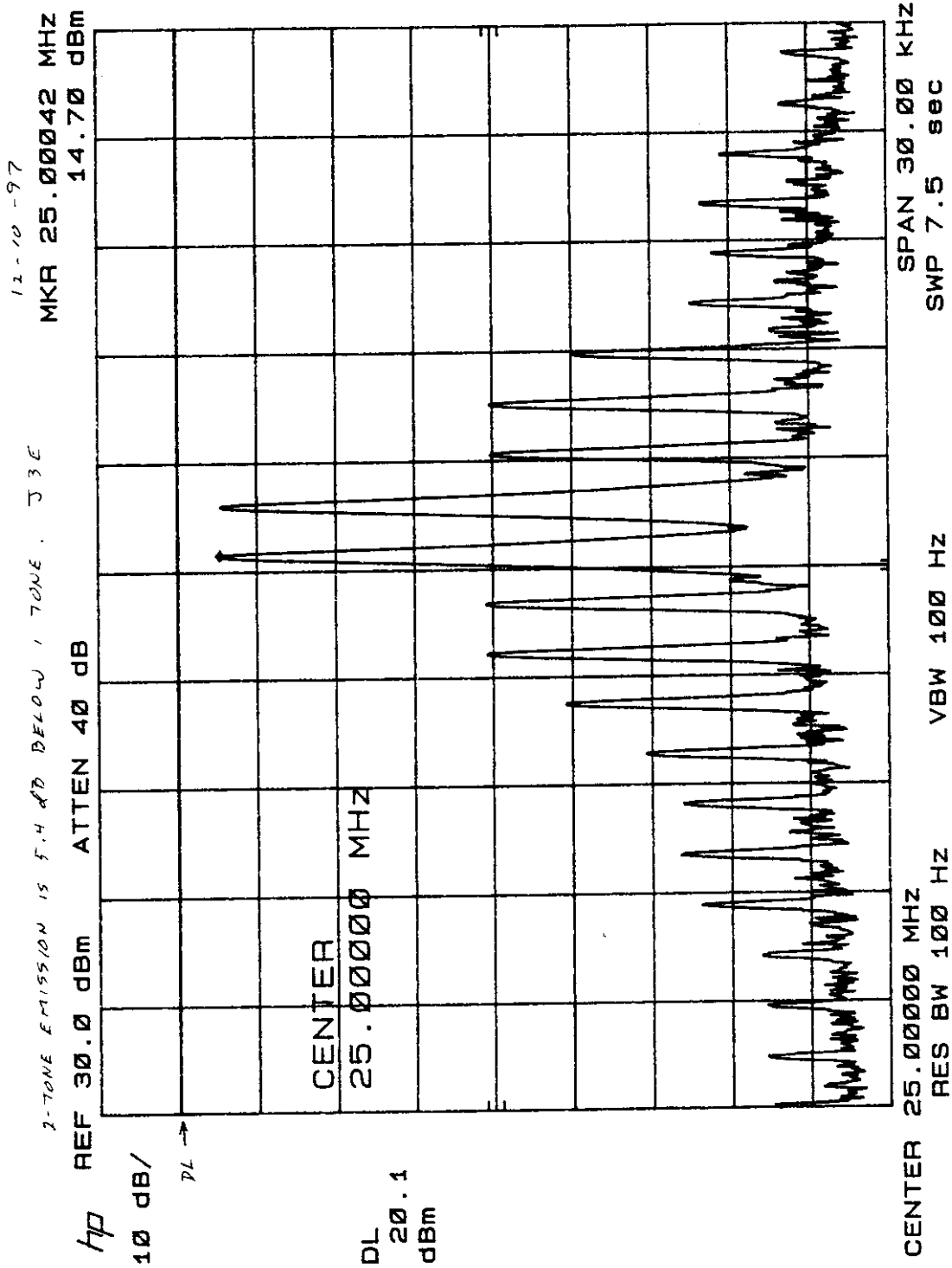
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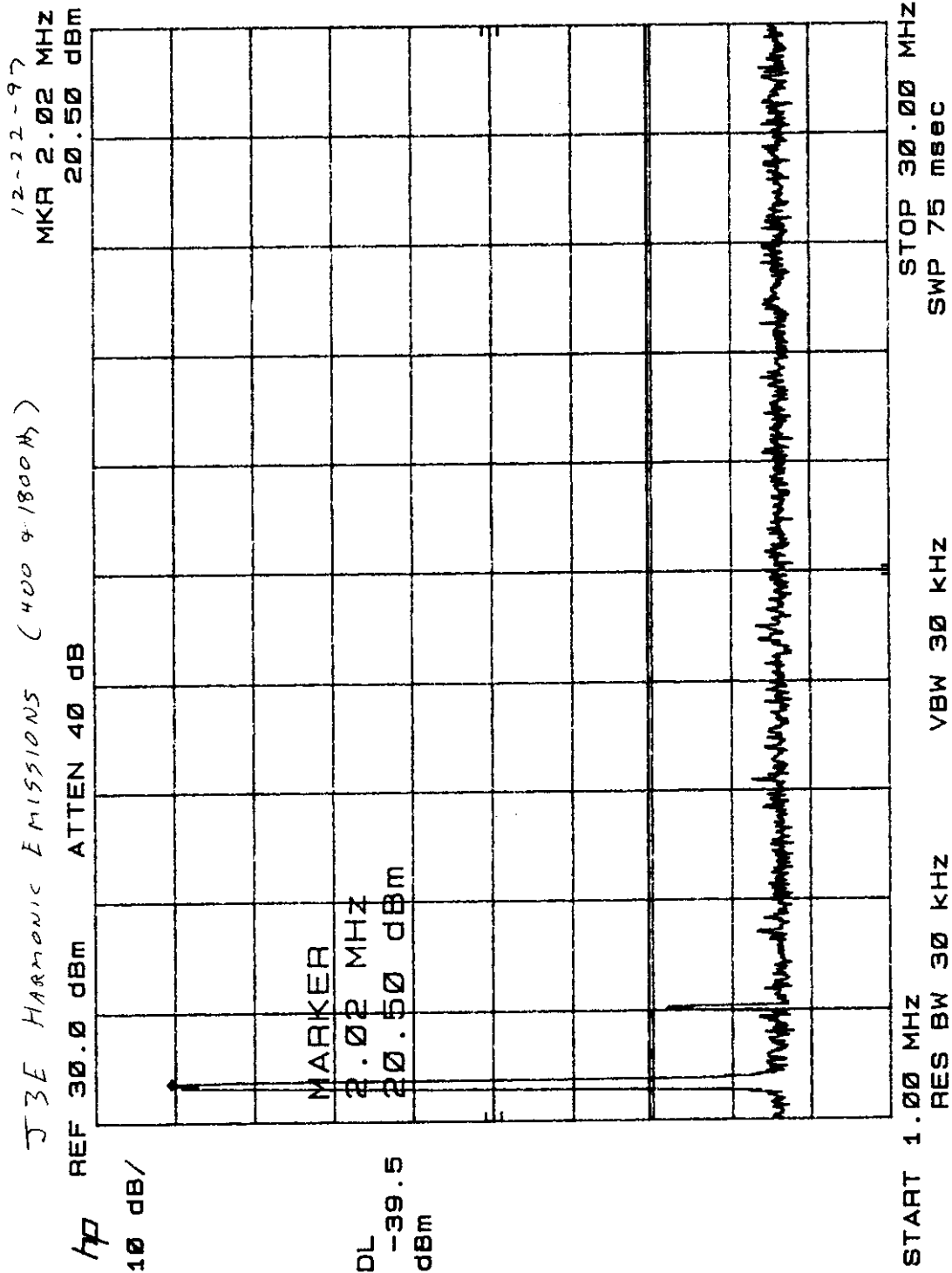
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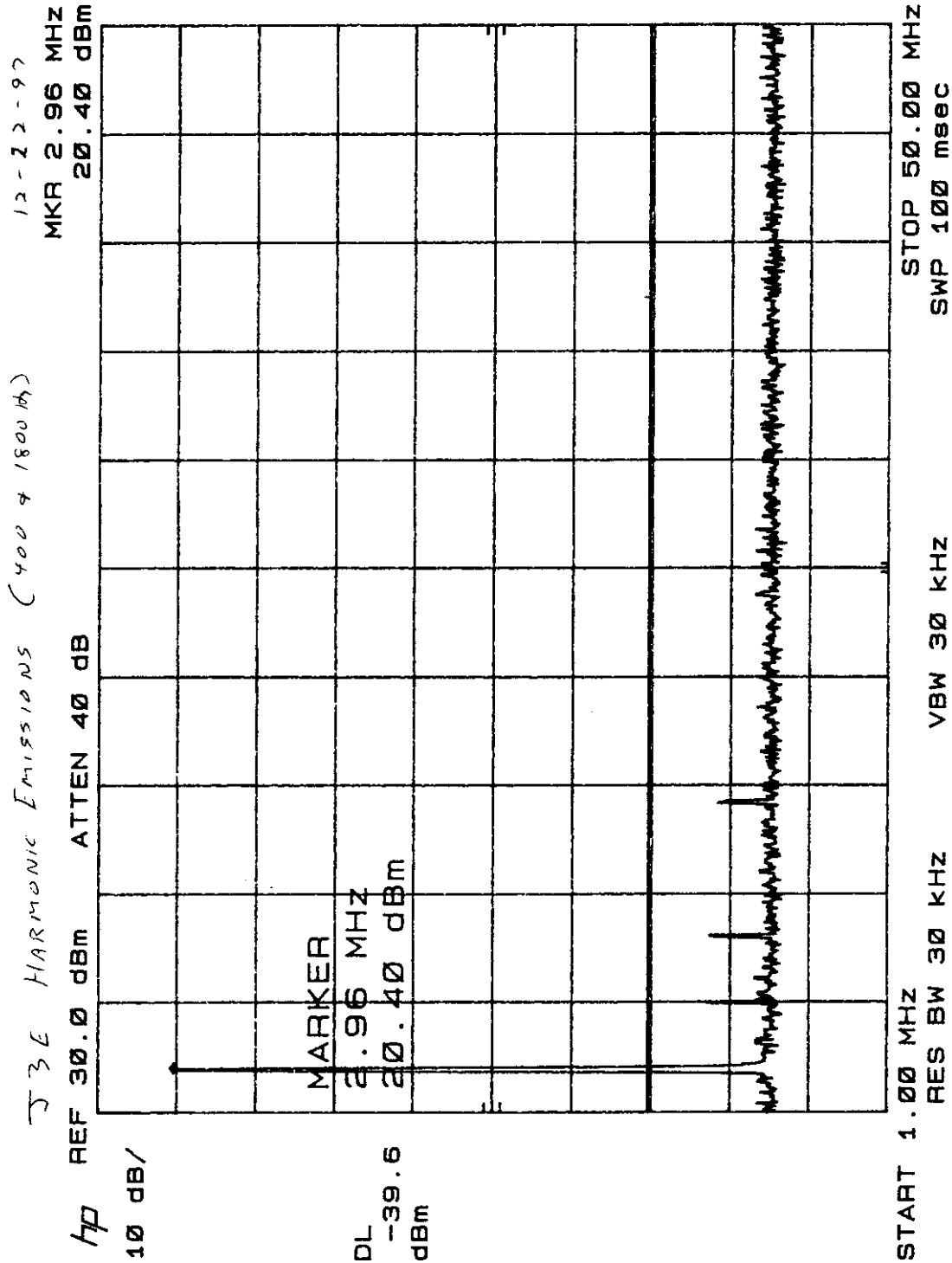


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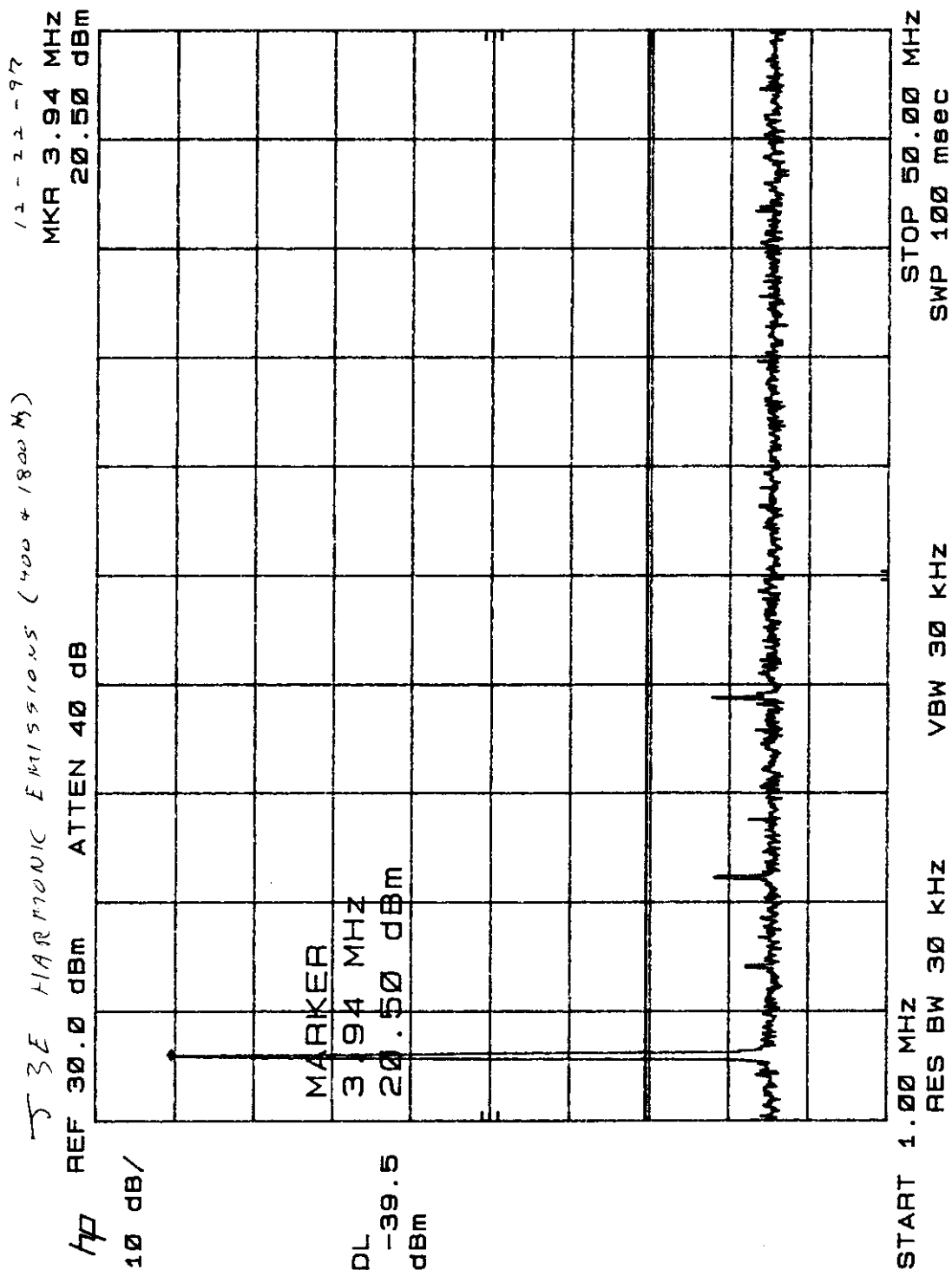
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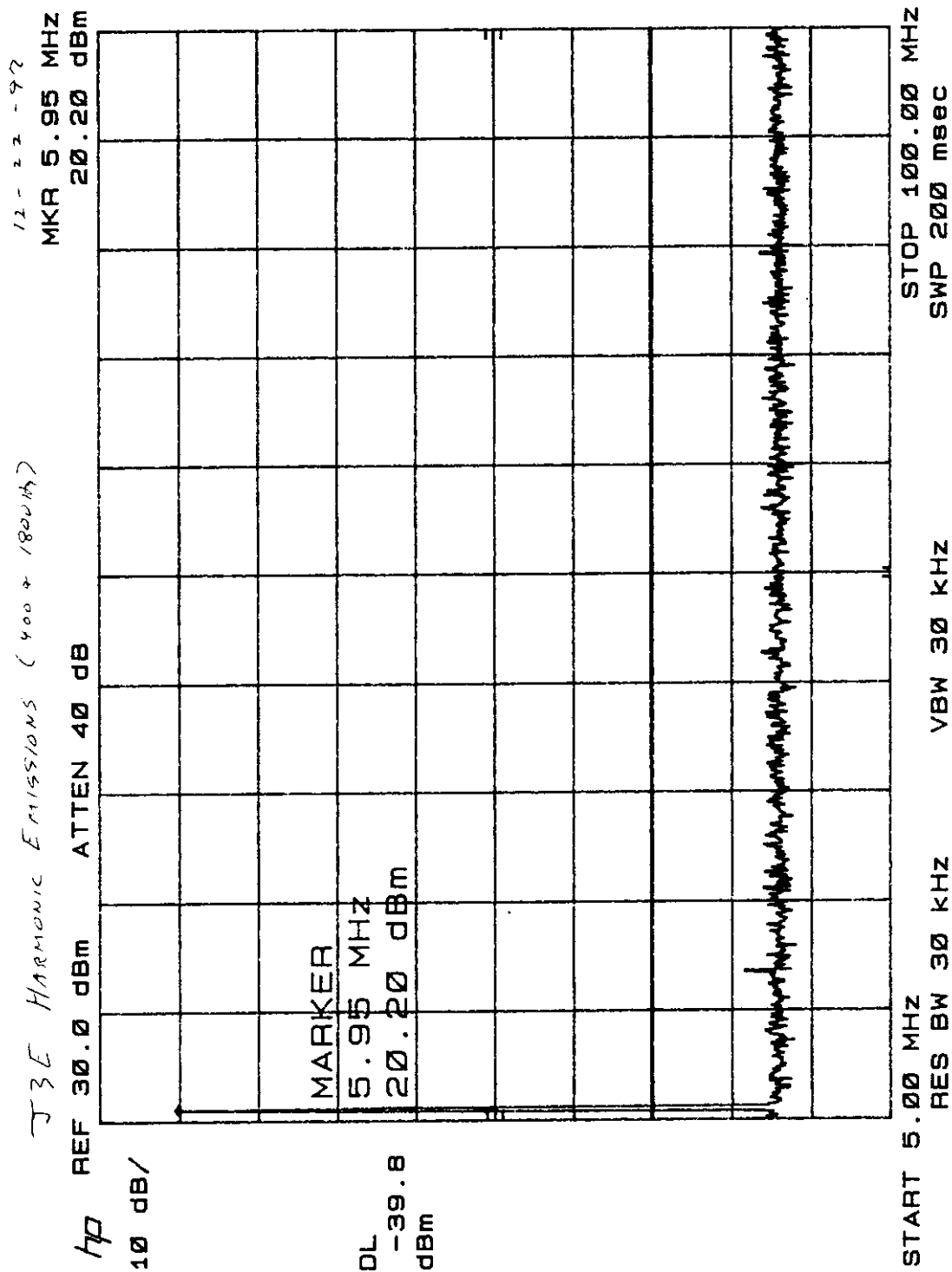
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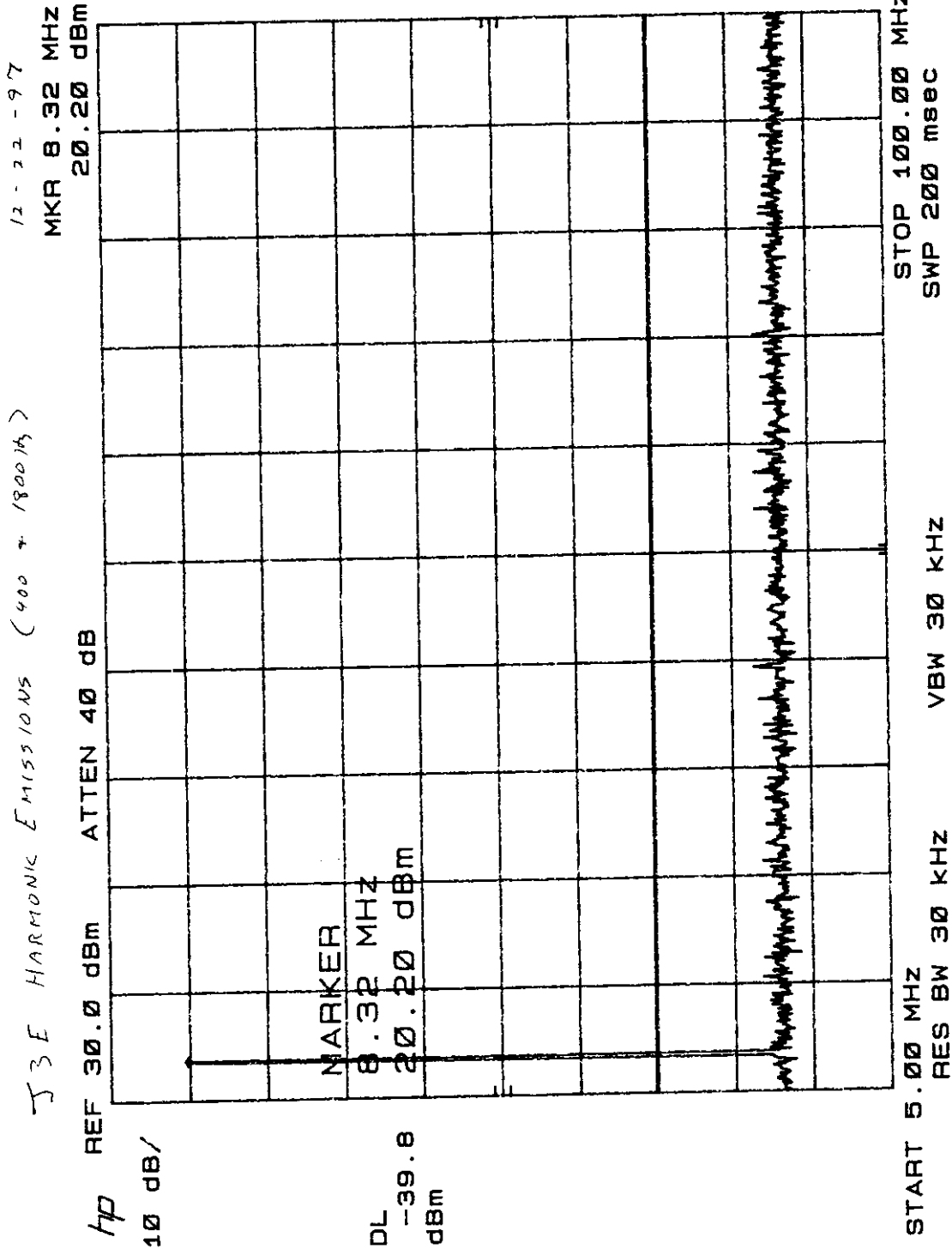
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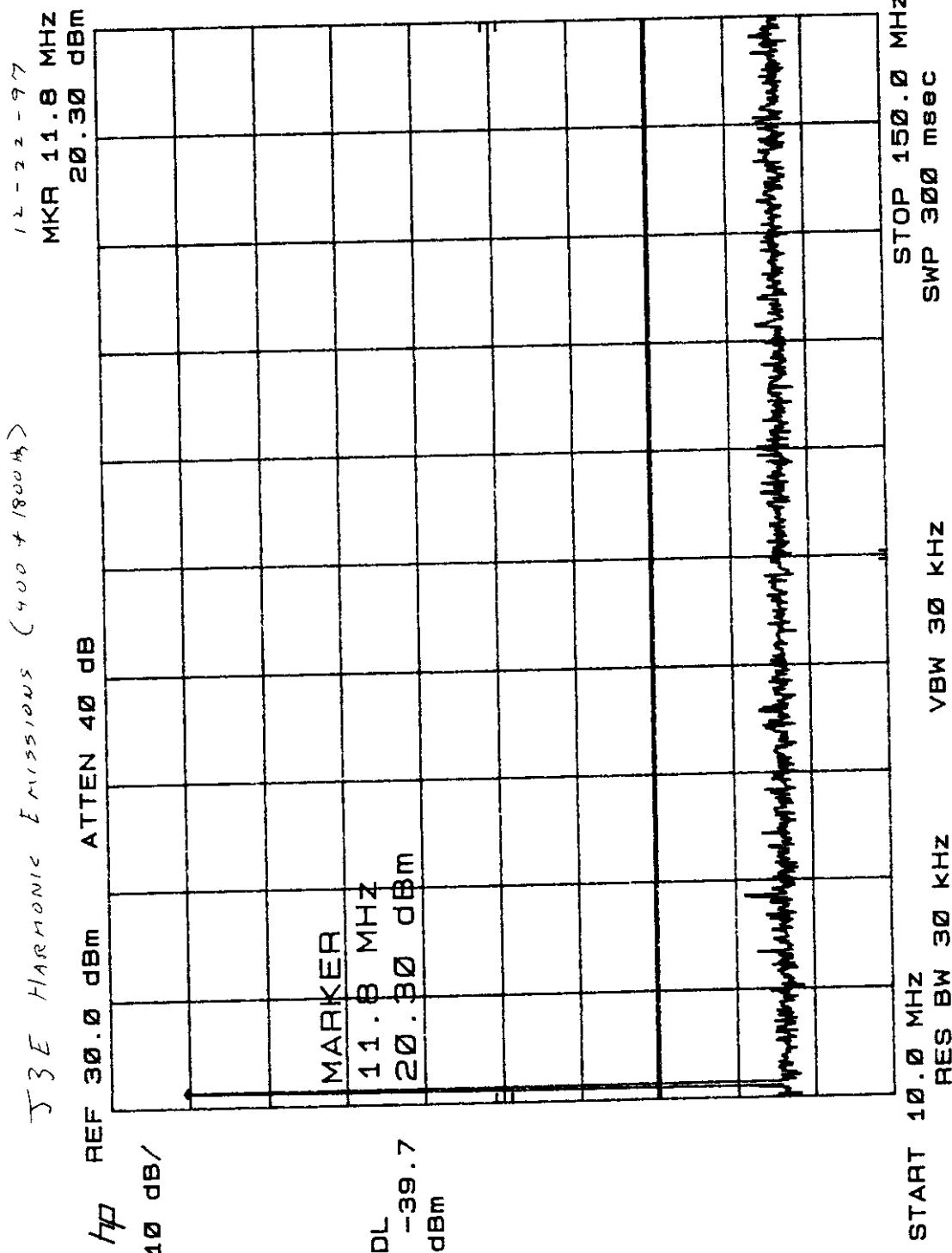
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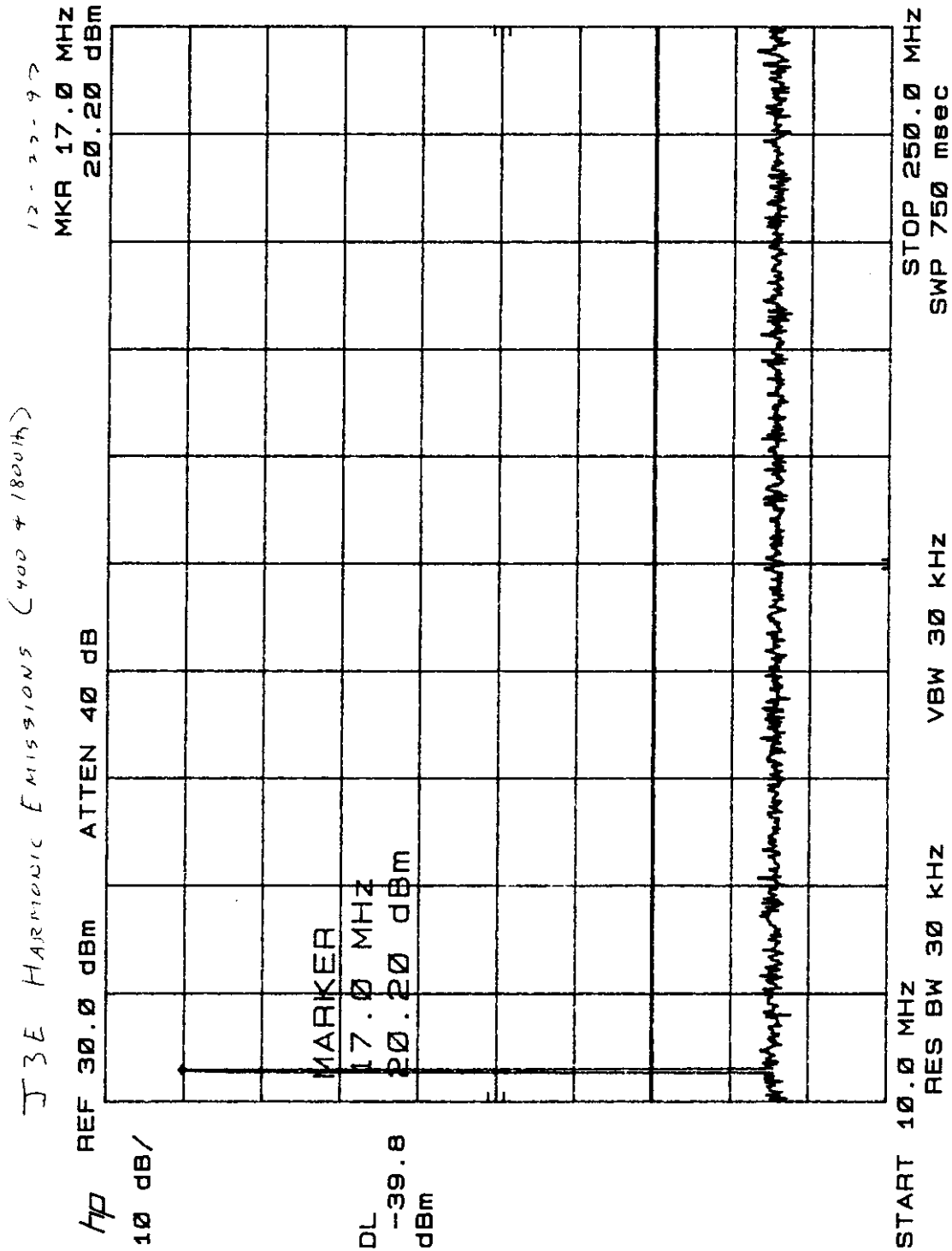
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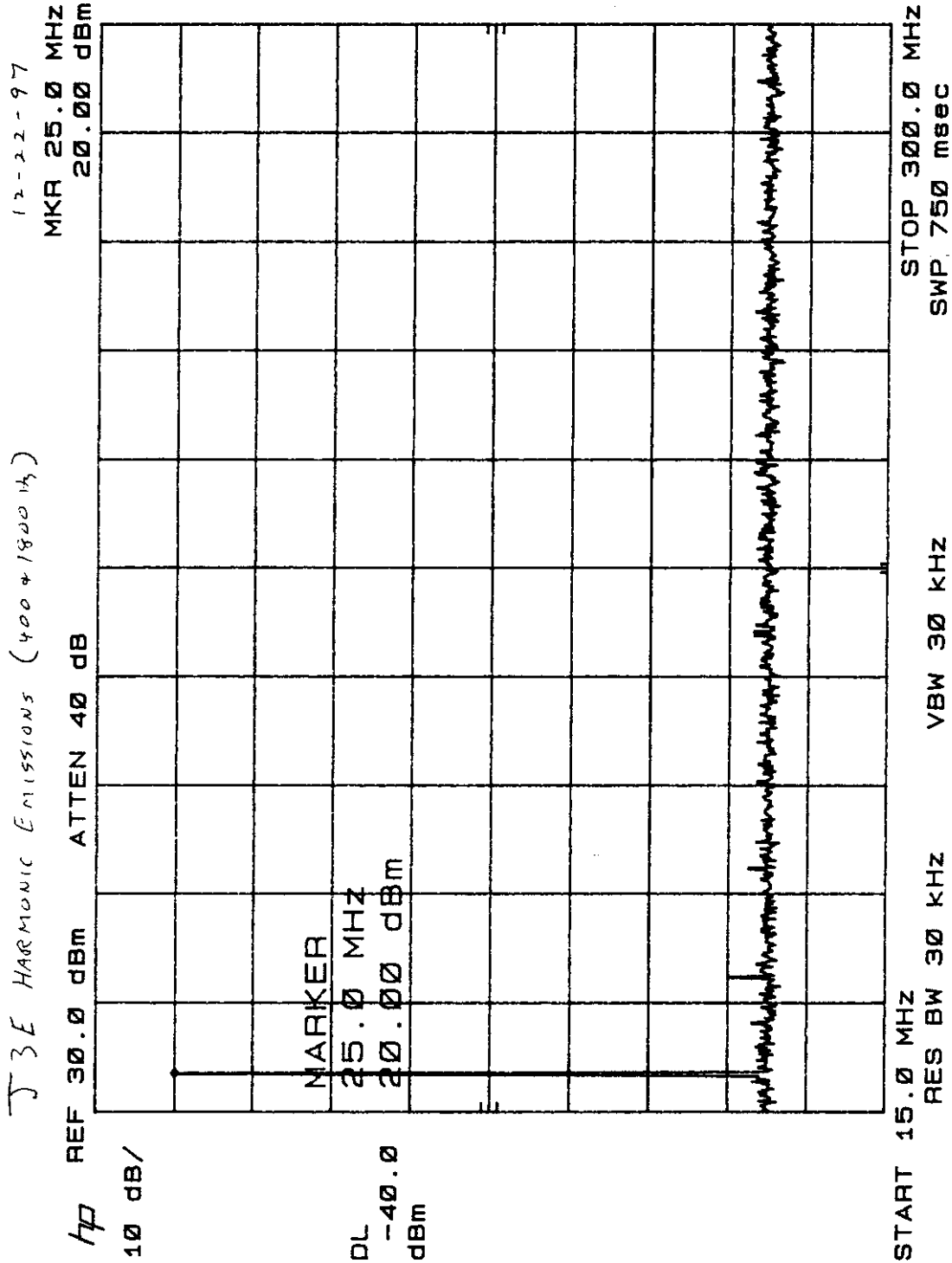
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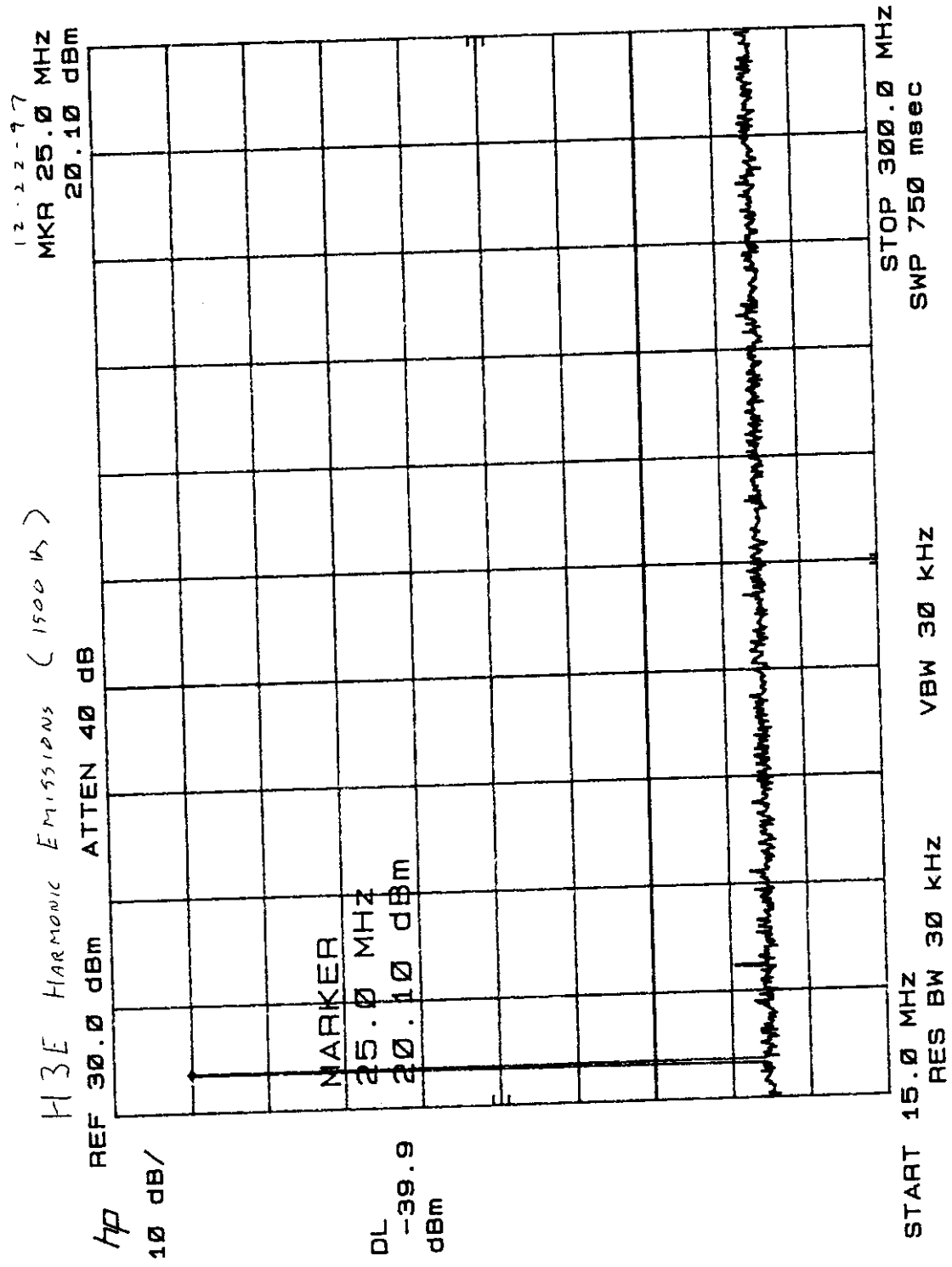


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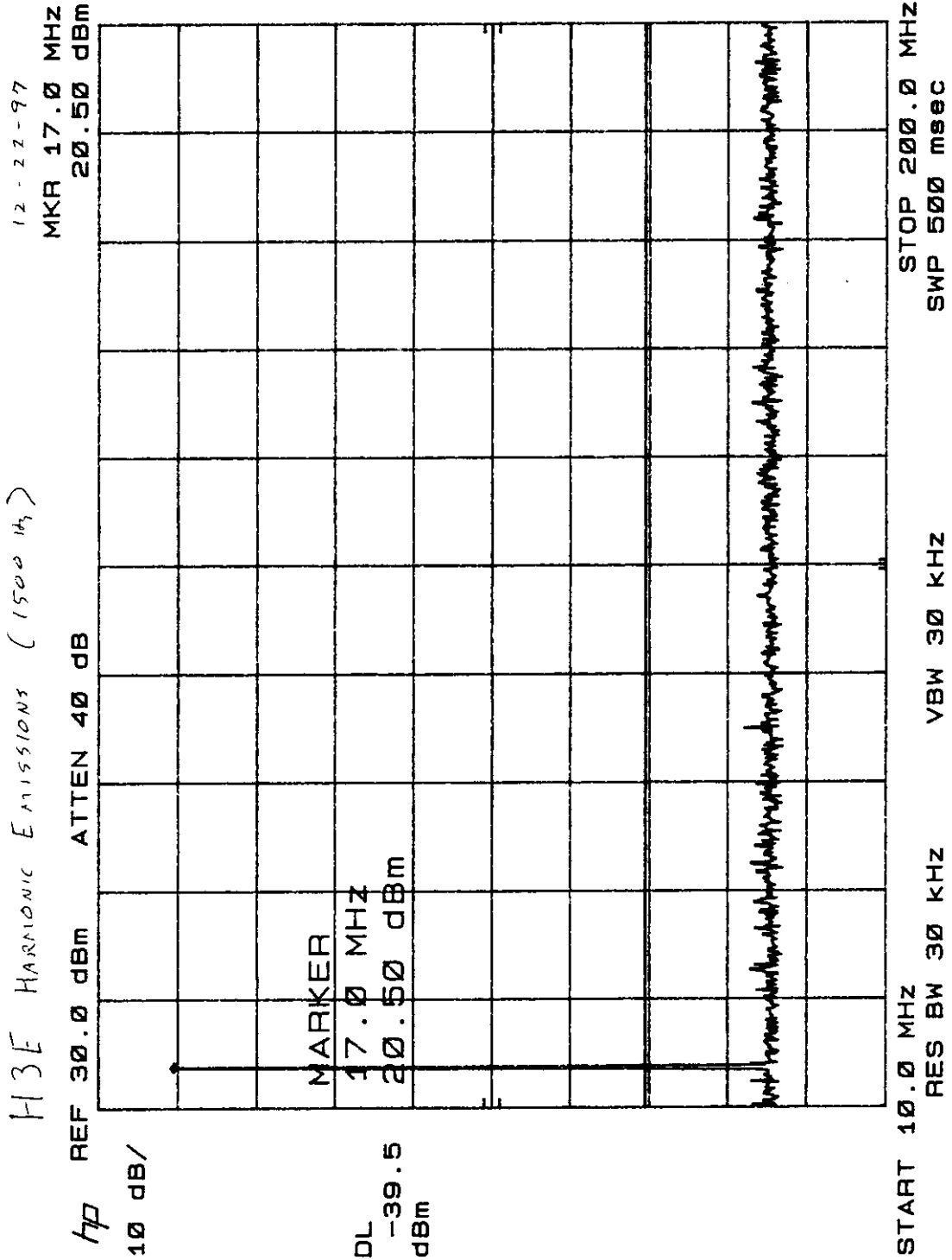


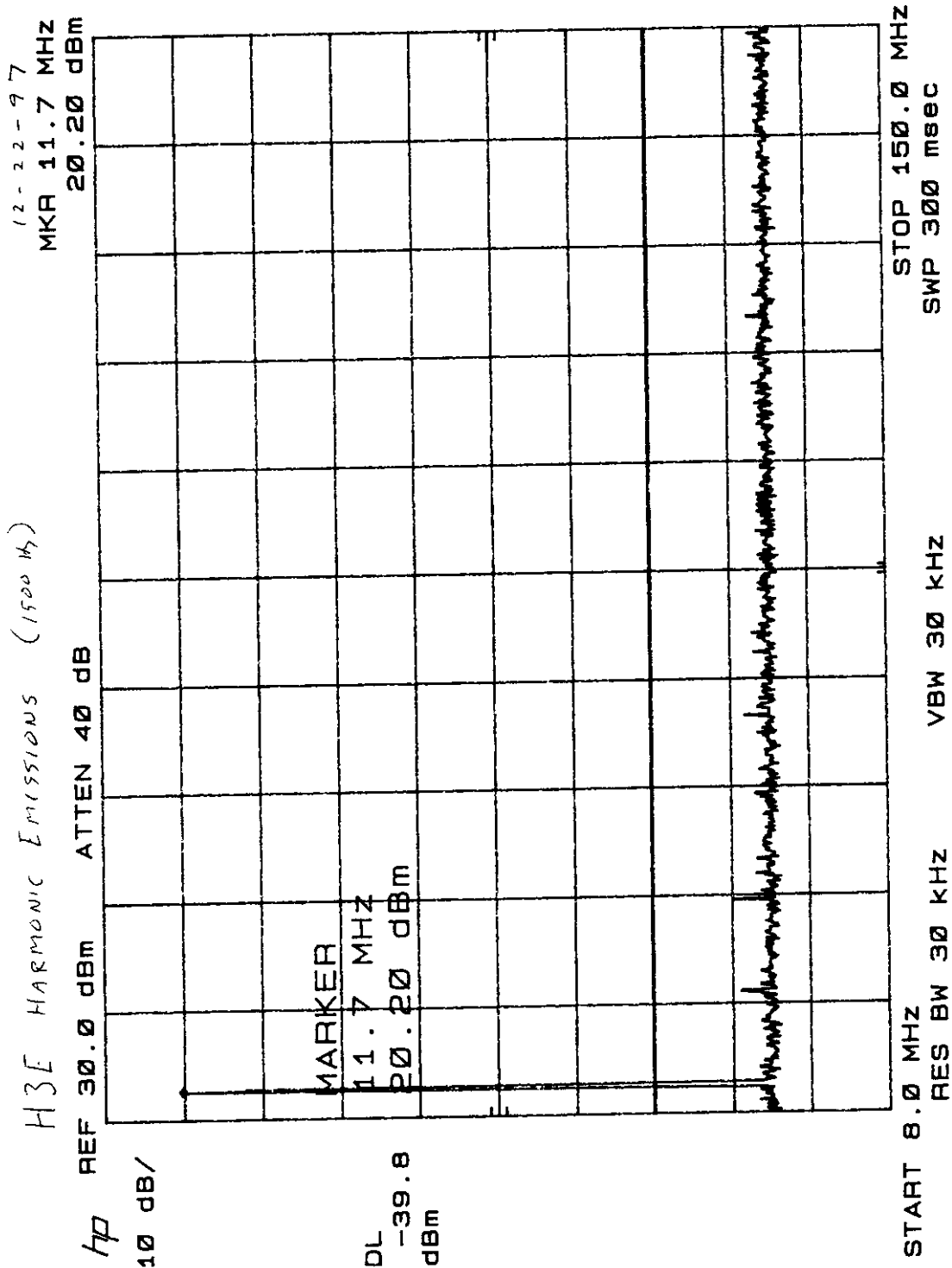
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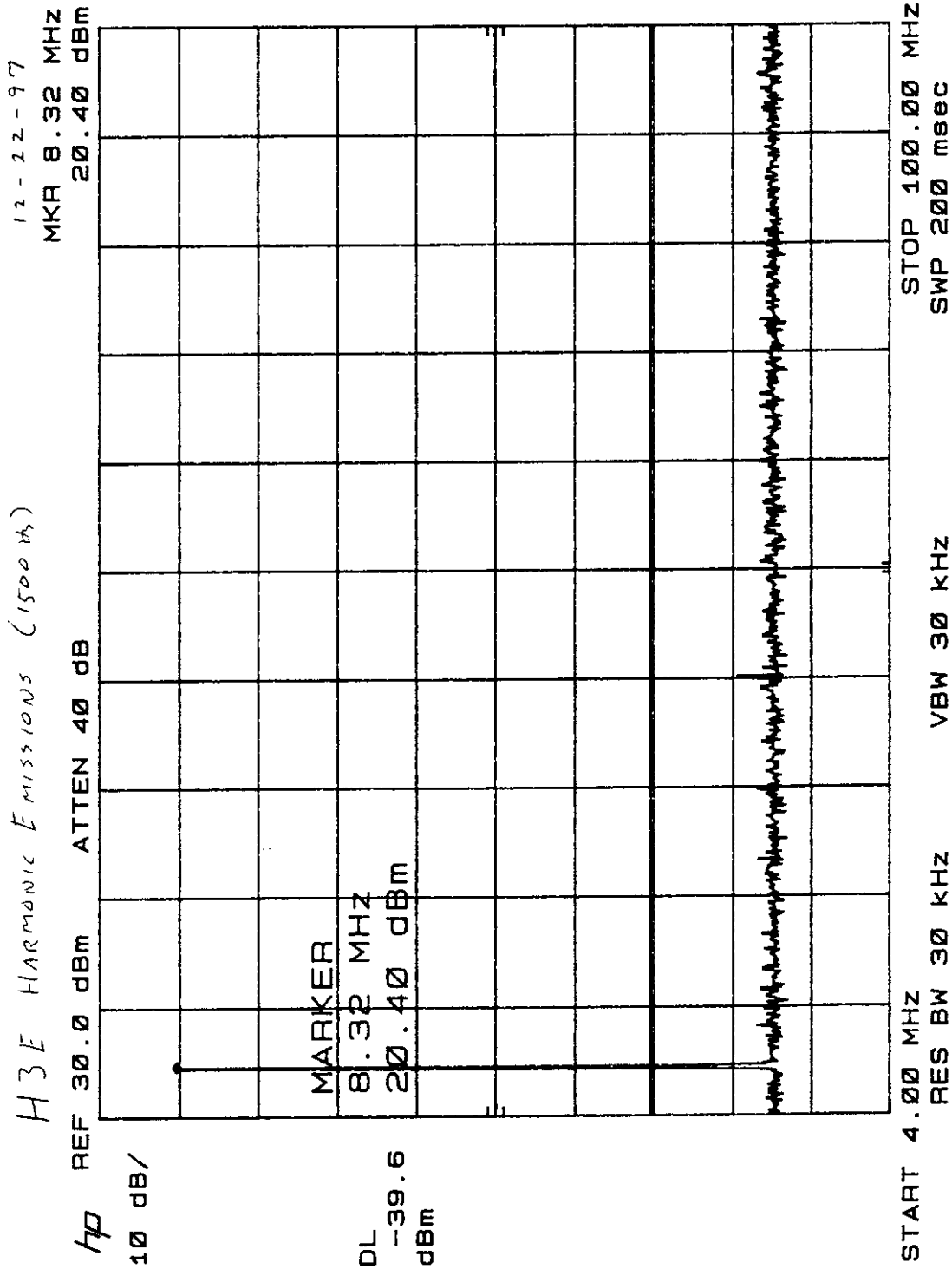


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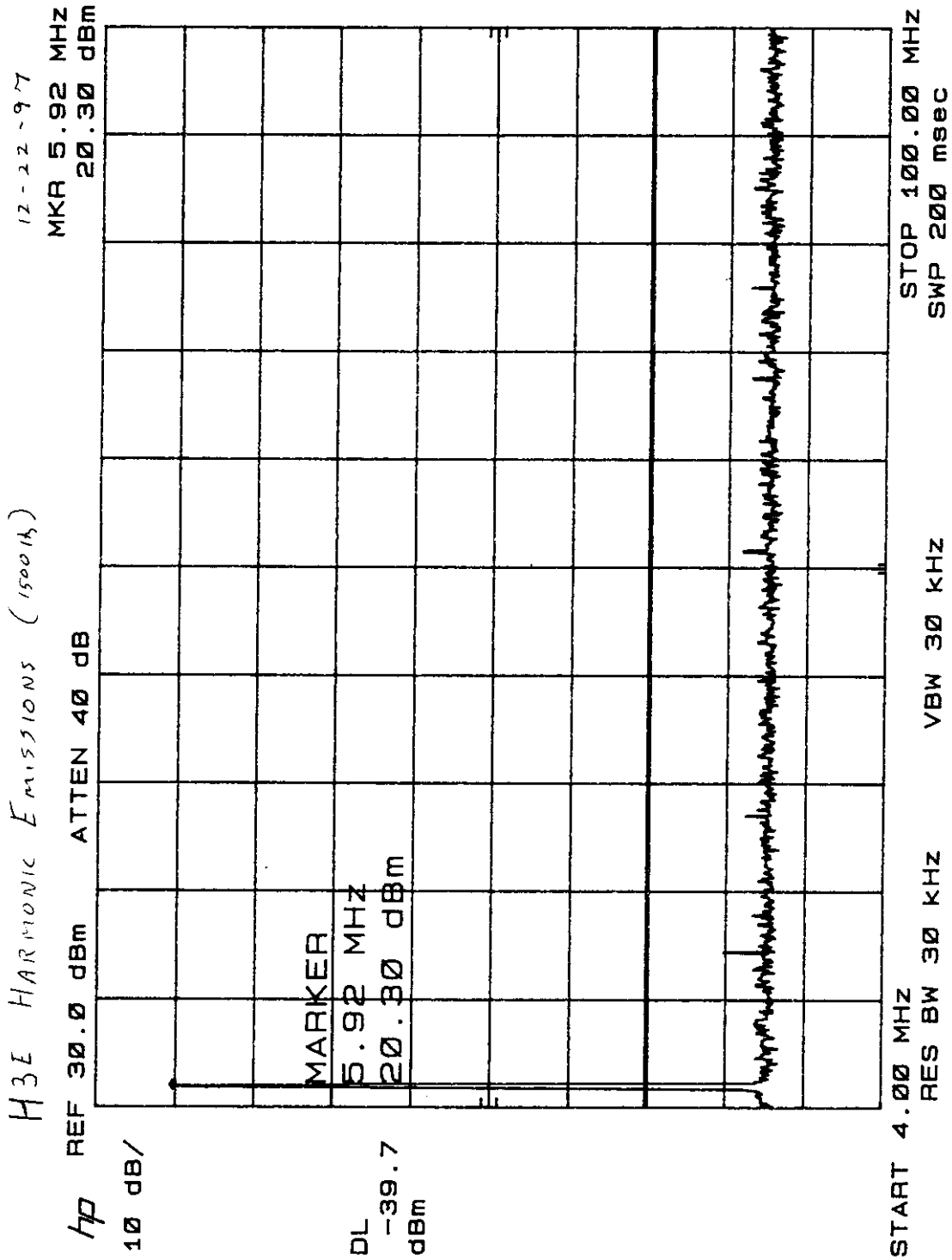




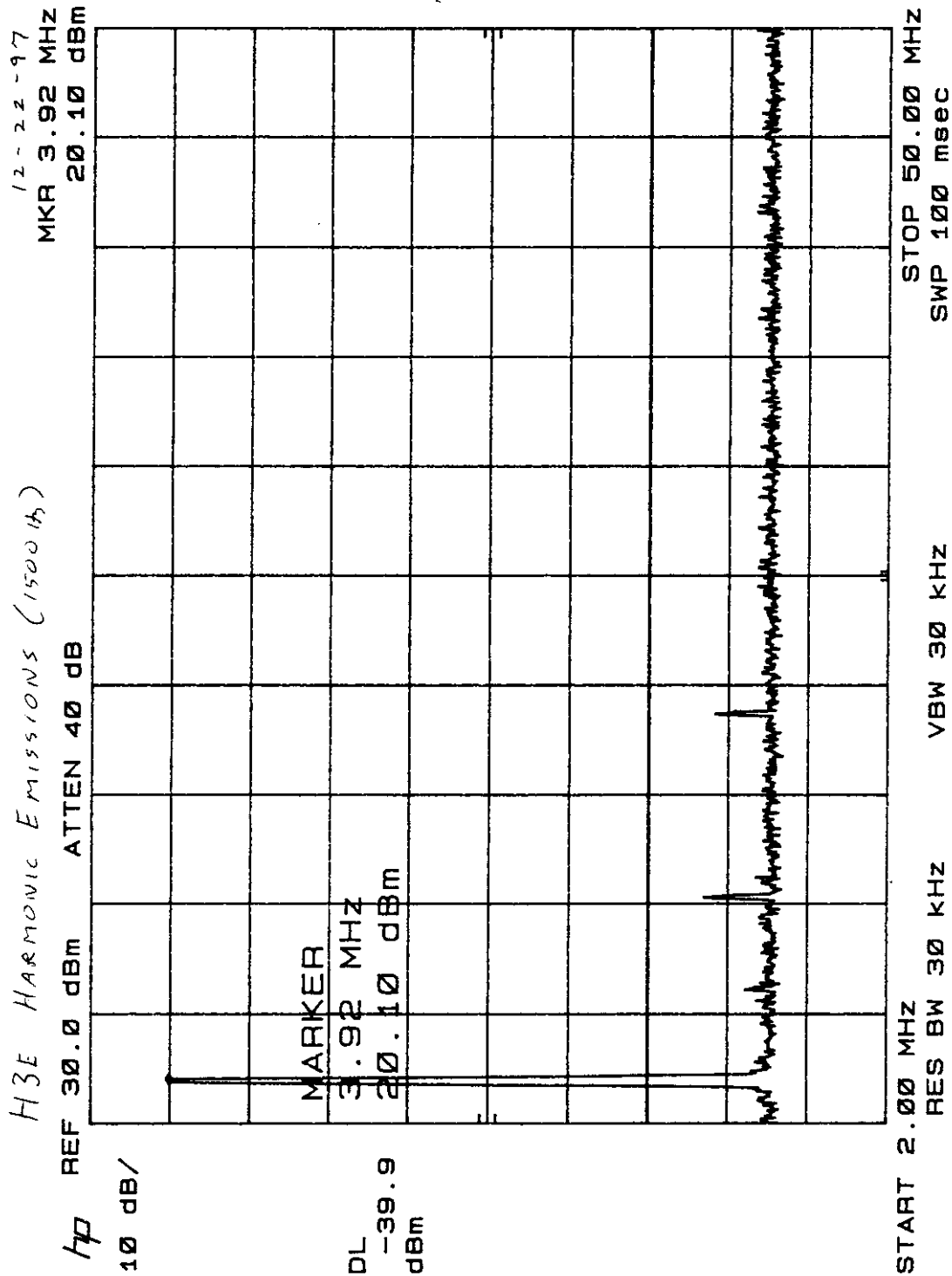
Electromagnetic Engineering Services, Inc.			11696 Sorrento Valley Road, Suite. F, San Diego, CA 92121 (619) 259-4940 Voice (619) 259-7170 Fax		
Revision	Date	Document Name	Document #	FCC ID#	Page #
A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	171



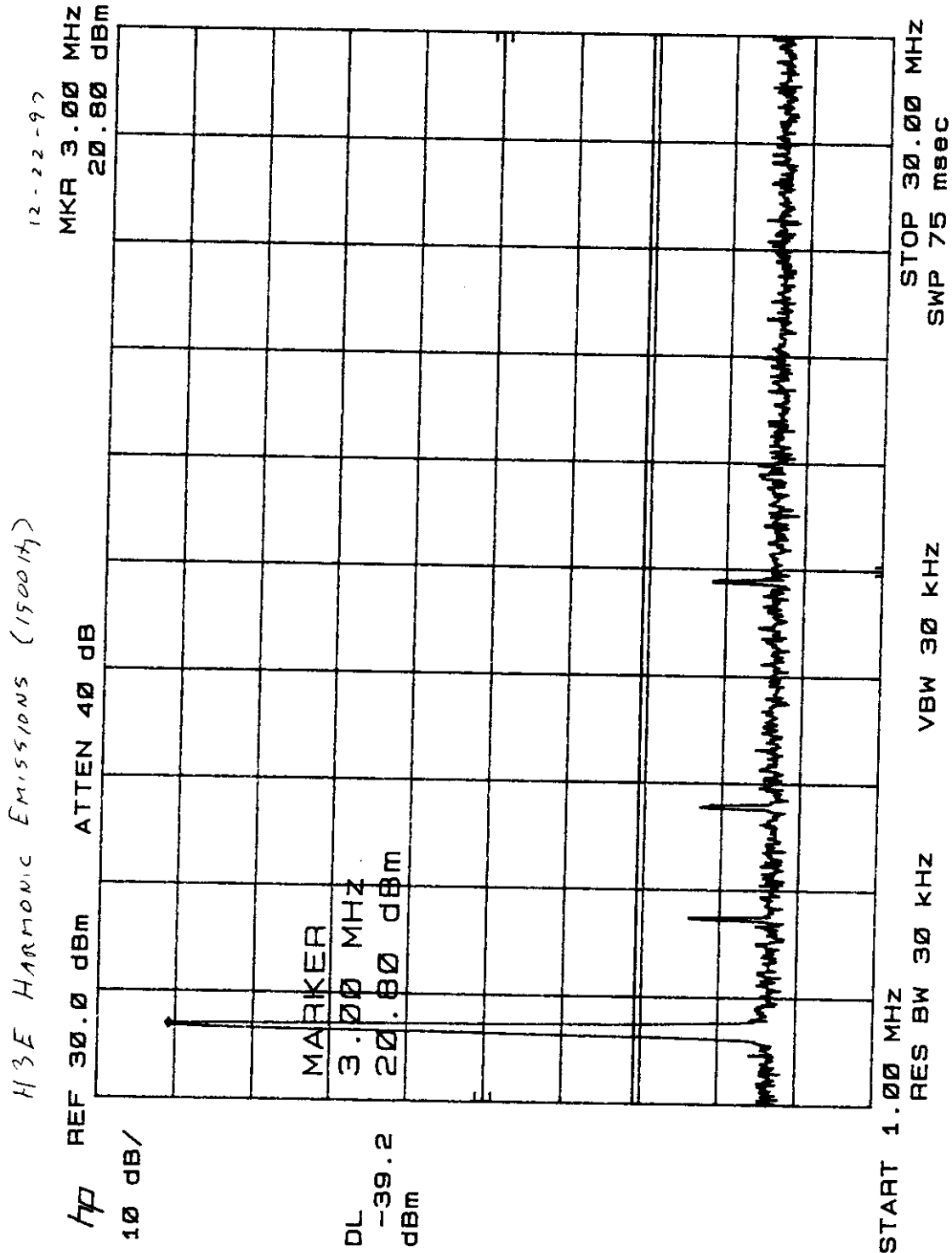
Electromagnetic Engineering Services, Inc.			11696 Sorrento Valley Road, Suite. F, San Diego, CA 92121 (619) 259-4940 Voice (619) 259-7170 Fax		
Revision	Date	Document Name	Document #	FCC ID#	Page #
A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	172



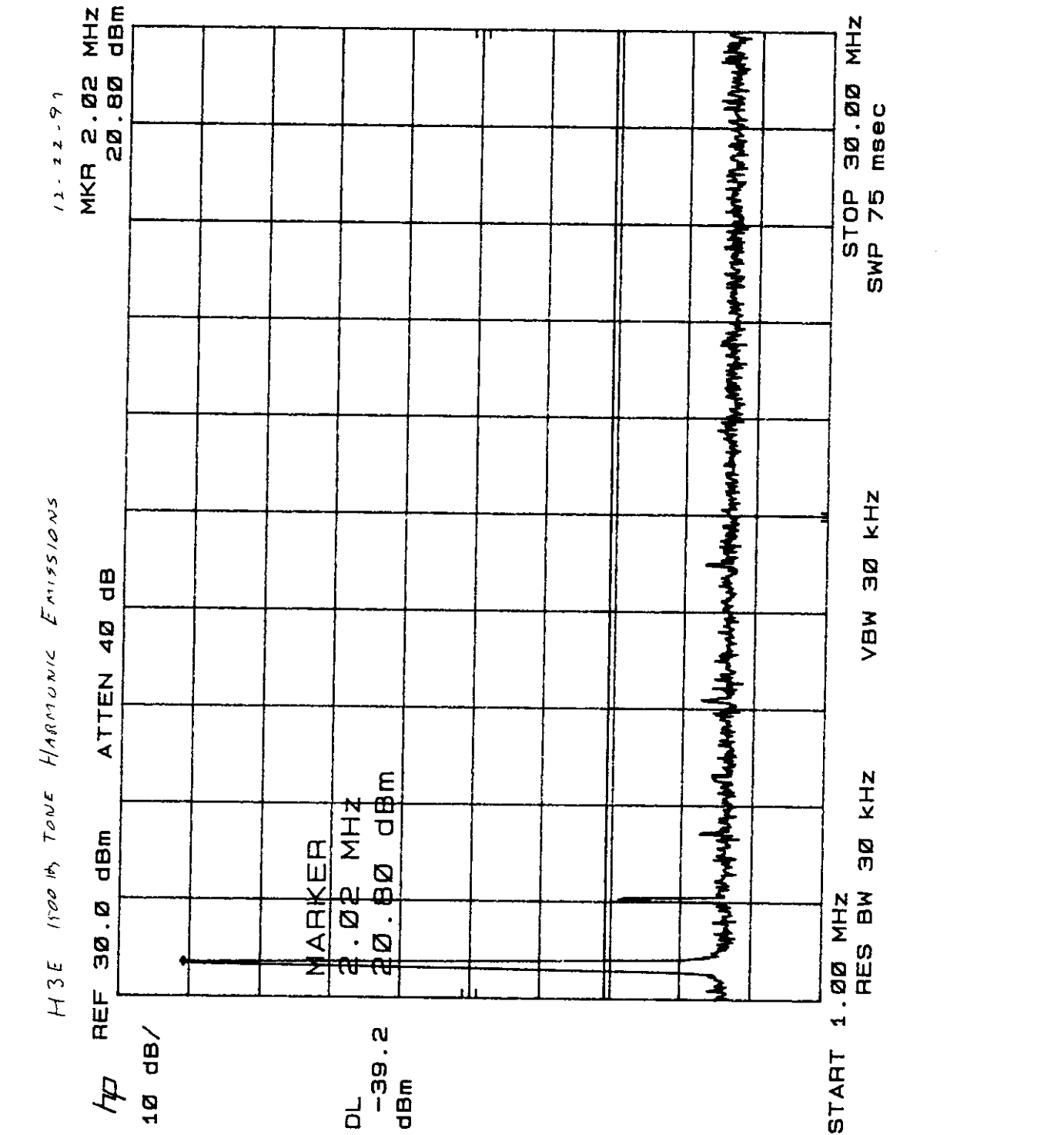
Electromagnetic Engineering Services, Inc.			11696 Sorrento Valley Road, Suite. F, San Diego, CA 92121 (619) 259-4940 Voice (619) 259-7170 Fax		
Revision	Date	Document Name	Document #	FCC ID#	Page #
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Revision	Date	Document Name	Document #	FCC ID#	Page #
A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	174



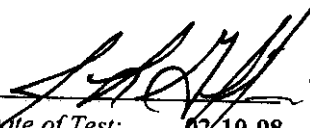
Electromagnetic Engineering Services, Inc.			11696 Sorrento Valley Road, Suite. F, San Diego, CA 92121 (619) 259-4940 Voice (619) 259-7170 Fax		
Revision	Date	Document Name	Document #	FCC ID#	Page #
A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	175



Electromagnetic Engineering Services, Inc.			11696 Sorrento Valley Road, Suite. F, San Diego, CA 92121 (619) 259-4940 Voice (619) 259-7170 Fax		
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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	177

Electromagnetic Engineering Services, Incorporated
FCC, Part 87 (Section 2.993) Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: Cubic Communications

Conducted by: 

EUT: HF Exciter, Amp, Power Supply (24.9MHz, J3E mode)

Date of Test: 02-10-98

Model #: T-4180, PA-5050A, PS-7130A
400 & 1800 Hz modulation

Test Distance, Amp. gain: 10 m, 0 dB

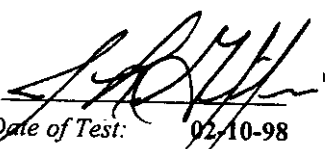
Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for 10 m (dBuV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
24.900	66.1	v	28.0	94.1	146.9	-52.8
49.800	19.6	v	15.3	34.9	74.0	-39.1
74.700	42.1	h	10.9	53.0	74.0	-21.0
99.500	27.8	v	16.8	44.6	74.0	-29.4
124.500	26.0	v	16.1	42.1	74.0	-31.9
149.400	12.1	v	17.8	29.9	74.0	-44.1
174.300	25.8	v	20.8	46.6	74.0	-27.4
199.200	19.4	h	21.3	40.7	74.0	-33.3
224.100	16.4	v	16.0	32.4	74.0	-41.6
249.000	21.1	v	17.5	38.6	74.0	-35.4

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

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A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	178

Electromagnetic Engineering Services, Incorporated
FCC, Part 87 (Section 2.993) Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: Cubic Communications

Conducted by: 

EUT: HF Exciter, Amp, Power Supply (24.9MHz, H3E mode)

Date of Test: 02-10-98

Model #: T-4180, PA-5050A, PS-7130A

Test Distance, Amp. gain: 10 m, 0 dB

1500 Hz modulation

Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for 10 m (dBuV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
24.900	67.5	h	28.0	95.5	146.9 ✓	-51.4
49.800	24.8	v	15.3	40.1	74.0	-33.9
74.700	58.2	v	10.9	69.1	74.0	-4.9
99.500	16.7	v	16.8	33.5	74.0	-40.5
124.500	27.9	v	16.1	44.0	74.0	-30.0
149.400	34.9	v	17.8	52.7	74.0	-21.3
174.300	33.8	h	20.8	54.6	74.0	-19.4
199.200	20.8	v	21.3	42.1	74.0	-31.9
224.100	19.8	h	16.0	35.8	74.0	-38.2
249.000	18.8	h	17.5	36.3	74.0	-37.7

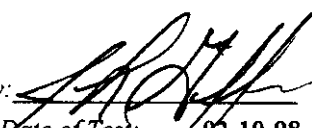
*See
1020 notes*

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

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Revision	Date	Document Name	Document #	FCC ID#	Page #
A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	179

Electromagnetic Engineering Services, Incorporated
FCC, Part 87 (Section 2.993) Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: Cubic Communications

Conducted by: 

EUT: HF Exciter, Amp, Power Supply (17.3MHz, H3E mode)

Date of Test: 02-10-98

Model #: T-4180, PA-5050A, PS-7130A

Test Distance, Amp. gain: 10 m, 0 dB

1500 Hz modulation

Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for 10 m (dBμV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
17.300	30.3	v	25.8	56.1	146.9	-90.8
34.600	16.1	v	14.1	30.2	74.0	-43.8
51.900	43.3	v	15.4	58.7	74.0	-15.3
69.200	32.1	v	12.2	44.3	74.0	-29.7
86.500	42.6	v	13.6	56.2	74.0	-17.8
103.900	24.3	v	17.5	41.8	74.0	-32.2
121.300	20.5	h	16.9	37.4	74.0	-36.6
138.700	25.1	v	16.2	41.3	74.0	-32.7
156.000	40.3	v	18.8	59.1	74.0	-14.9
173.300	17.2	v	20.7	37.9	74.0	-36.1

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

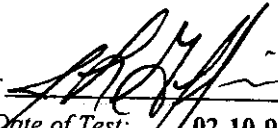
Electromagnetic Engineering Services, Inc.			11696 Sorrento Valley Road, Suite. F, San Diego, CA 92121 (619) 259-4940 Voice (619) 259-7170 Fax		
Revision	Date	Document Name	Document #	FCC ID#	Page #
A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	180

Electromagnetic Engineering Services, Incorporated
FCC, Part 87 (Section 2.993) Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: Cubic Communications

EUT: HF Exciter, Amp, Power Supply (17.3MHz, J3E mode)

Model #: T-4180, PA-5050A, PS-7130A
400Hz & 1800 Hz modulation

Conducted by: 

Date of Test: 02-10-98

Test Distance, Amp. gain: 10 m, 0 dB

Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for 10 m (dBμV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
17.300	29.5	v	25.8	55.3	146.9	-91.6
34.600	13.4	v	14.1	27.5	74.0	-46.5
51.900	35.9	v	15.4	51.3	74.0	-22.7
69.200	26.1	v	12.2	38.3	74.0	-35.7
86.500	37.0	v	13.6	50.6	74.0	-23.4
103.900	21.3	v	17.5	38.8	74.0	-35.2
121.300	20.7	v	16.9	37.6	74.0	-36.4
138.700	22.6	v	16.2	38.8	74.0	-35.2
156.000	38.6	v	18.8	57.4	74.0	-16.6
173.300	16.5	v	20.7	37.2	74.0	-36.8

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

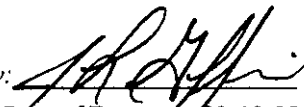
Electromagnetic Engineering Services, Inc.		11696 Sorrento Valley Road, Suite. F, San Diego, CA 92121 (619) 259-4940 Voice (619) 259-7170 Fax			
Revision	Date	Document Name	Document #	FCC ID#	Page #
A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	181

Electromagnetic Engineering Services, Incorporated
FCC, Part 87 (Section 2.993) Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: Cubic Communications

EUT: HF Exciter, Amp, Power Supply (12MHz, J3E mode)

Model #: T-4180, PA-5050A, PS-7130A

Conducted by: 

Date of Test: 02-10-98

Test Distance, Amp. gain: 10 m, 0 dB

Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for 10 m (dBuV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
12.000	34.2	v	31.5	65.7	146.9	-81.2
24.000	21.3	v	27.2	48.5	74.0	-25.5
36.000	36.3	v	13.9	50.2	74.0	-23.8
48.000	20.0	v	15.0	35.0	74.0	-39.0
60.000	37.0	v	15.0	52.0	74.0	-22.0
72.000	26.7	v	11.5	38.2	74.0	-35.8
84.000	39.6	v	11.4	51.0	74.0	-23.0
96.000	20.8	v	16.0	36.8	74.0	-37.2
108.000	30.5	v	18.8	49.3	74.0	-24.7
120.000	11.4	v	17.3	28.7	74.0	-45.3

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

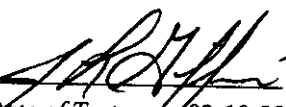
Electromagnetic Engineering Services, Inc.			11696 Sorrento Valley Road, Suite. F, San Diego, CA 92121 (619) 259-4940 Voice (619) 259-7170 Fax		
Revision	Date	Document Name	Document #	FCC ID#	Page #
A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	182

Electromagnetic Engineering Services, Incorporated
FCC, Part 87 (Section 2.993) Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: Cubic Communications

EUT: HF Exciter, Amp, Power Supply (12MHz, H3E mode)

Model #: T-4180, PA-5050A, PS-7130A

Conducted by: 

Date of Test: 02-10-98

Test Distance, Amp. gain: 10 m, 0 dB

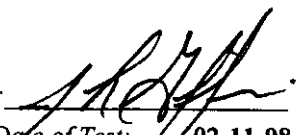
Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for 10 m (dBuV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
12.000	36.5	v	31.5	68.0	146.9	-78.9
24.000	25.1	h	27.2	52.3	74.0	-21.7
36.000	41.3	v	13.9	55.2	74.0	-18.8
48.000	19.4	v	15.0	34.4	74.0	-39.6
60.000	40.4	v	15.0	55.4	74.0	-18.6
72.000	29.4	v	11.5	40.9	74.0	-33.1
84.000	43.8	v	11.4	55.2	74.0	-18.8
96.000	20.4	v	16.0	36.4	74.0	-37.6
108.000	36.2	v	18.8	55.0	74.0	-19.0
120.000	14.2	h	17.3	31.5	74.0	-42.5

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

Electromagnetic Engineering Services, Inc.			11696 Sorrento Valley Road, Suite. F, San Diego, CA 92121 (619) 259-4940 Voice (619) 259-7170 Fax		
Revision	Date	Document Name	Document #	FCC ID#	Page #
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Electromagnetic Engineering Services, Incorporated
FCC, Part 87 (Section 2.993) Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: Cubic Communications
EUT: HF Exciter, Amp, Power Supply (8.5MHz, J3E mode)
Model #: T-4180, PA-5050A, PS-7130A

Conducted by: 
Date of Test: 02-11-98
Test Distance, Amp. gain: 10 m, 0 dB

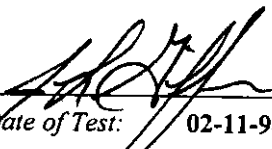
Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for 10 m (dBuV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
8.500	26.4	v	30.5	56.9	146.9	-90.0
17.000	6.0	v	25.7	31.7	74.0	-42.3
25.500	41.4	v	28.0	69.4	74.0	-4.6
34.000	18.8	v	14.2	33.0	74.0	-41.0
42.500	39.8	v	14.1	53.9	74.0	-20.1
51.000	25.2	v	15.4	40.6	74.0	-33.4
59.500	49.1	v	15.1	64.2	74.0	-9.8
68.000	27.0	v	12.6	39.6	74.0	-34.4
76.500	35.6	v	10.7	46.3	74.0	-27.7
85.000	25.0	v	11.7	36.7	74.0	-37.3

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

Electromagnetic Engineering Services, Inc.			11696 Sorrento Valley Road, Suite. F, San Diego, CA 92121 (619) 259-4940 Voice (619) 259-7170 Fax		
Revision	Date	Document Name	Document #	FCC ID#	Page #
A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCCTX-1000	184

Electromagnetic Engineering Services, Incorporated
FCC, Part 87 (Section 2.993) Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: Cubic Communications

Conducted by: 

EUT: HF Exciter, Amp, Power Supply (8.5MHz, H3E mode)

Date of Test: 02-11-98

Model #: T-4180, PA-5050A, PS-7130A

Test Distance, Amp. gain: 10 m, 0 dB

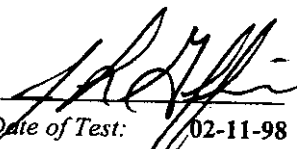
Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for 10 m (dBuV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
8.500	26.4	v	30.5	56.9	146.9	-90.0
17.000	9.0	v	25.7	34.7	74.0	-39.3
25.500	36.5	v	28.0	64.5	74.0	-9.5
34.000	25.1	v	14.2	39.3	74.0	-34.7
42.500	46.1	v	14.1	60.2	74.0	-13.8
51.000	21.8	v	15.4	37.2	74.0	-36.8
59.500	42.0	v	15.1	57.1	74.0	-16.9
68.000	33.3	v	12.6	45.9	74.0	-28.1
76.500	36.5	v	10.7	47.2	74.0	-26.8
85.000	30.7	v	11.7	42.4	74.0	-31.6

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

Electromagnetic Engineering Services, Inc.			11696 Sorrento Valley Road, Suite. F, San Diego, CA 92121 (619) 259-4940 Voice (619) 259-7170 Fax		
Revision	Date	Document Name	Document #	FCC ID#	Page #
A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	185

Electromagnetic Engineering Services, Incorporated
FCC, Part 87 (Section 2.993) Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: Cubic Communications
EUT: HF Exciter, Amp, Power Supply (6MHz, J3E mode)
Model #: T-4180, PA-5050A, PS-7130A

Conducted by: 
Date of Test: 02-11-98
Test Distance, Amp. gain: 10 m, 0 dB

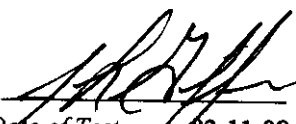
Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for 10 m (dBuV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
6.000	25.8	v	29.7	55.5	146.9	-91.4
12.000	3.2	v	31.5	34.7	74.0	-39.3
18.000	5.7	v	26.0	31.7	74.0	-42.3
24.000	20.2	v	27.2	47.4	74.0	-26.6
30.000	14.0	v	15.3	29.3	74.0	-44.7
36.000	14.0	v	13.9	27.9	74.0	-46.1
42.000	20.2	v	14.0	34.2	74.0	-39.8
48.000	12.5	v	15.0	27.5	74.0	-46.5
54.000	14.0	v	15.5	29.5	74.0	-44.5
60.000	19.5	h	15.0	34.5	74.0	-39.5

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

Electromagnetic Engineering Services, Inc.			11696 Sorrento Valley Road, Suite. F, San Diego, CA 92121 (619) 259-4940 Voice (619) 259-7170 Fax		
Revision	Date	Document Name	Document #	FCC ID#	Page #
A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	186

Electromagnetic Engineering Services, Incorporated
FCC, Part 87 (Section 2.993) Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: Cubic Communications
EUT: HF Exciter, Amp, Power Supply (6MHz, H3E mode)
Model #: T-4180, PA-5050A, PS-7130A

Conducted by: 
Date of Test: 02-11-98
Test Distance, Amp. gain: 10 m, 0 dB

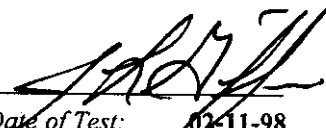
Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for 10 m (dBuV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
6.000	25.2	v	29.7	54.9	146.9	-92.0
12.000	3.2	v	31.5	34.7	74.0	-39.3
18.000	3.1	v	26.0	29.1	74.0	-44.9
24.000	18.5	h	27.2	45.7	74.0	-28.3
30.000	18.5	v	15.3	33.8	74.0	-40.2
36.000	13.0	v	13.9	26.9	74.0	-47.1
42.000	22.3	h	14.0	36.3	74.0	-37.7
48.000	14.7	h	15.0	29.7	74.0	-44.3
54.000	23.3	v	15.5	38.8	74.0	-35.2
60.000	21.8	h	15.0	36.8	74.0	-37.2

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

Electromagnetic Engineering Services, Inc.			11696 Sorrento Valley Road, Suite. F, San Diego, CA 92121 (619) 259-4940 Voice (619) 259-7170 Fax		
Revision	Date	Document Name	Document #	FCC ID#	Page #
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Electromagnetic Engineering Services, Incorporated
FCC, Part 87 (Section 2.993) Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: Cubic Communications
 EUT: HF Exciter, Amp, Power Supply (4MHz, H3E mode)
 Model #: T-4180, PA-5050A, PS-7130A

Conducted by: 
 Date of Test: 02-11-98
 Test Distance, Amp. gain: 10 m, 0 dB

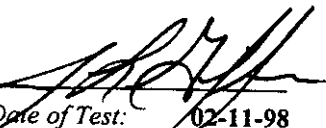
Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for 10 m (dBuV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
4.000	31.8	v	33.8	65.6	146.9	-81.3
8.000	1.2	v	30.3	31.5	74.0	-42.5
12.000	8.6	v	31.5	40.1	74.0	-33.9
16.000	1.9	h	25.6	27.5	74.0	-46.5
20.000	28.4	h	26.7	55.1	74.0	-18.9
24.000	18.7	v	27.2	45.9	74.0	-28.1
28.000	11.7	v	29.3	41.0	74.0	-33.0
32.000	24.8	v	14.8	39.6	74.0	-34.4
36.000	18.0	v	13.9	31.9	74.0	-42.1
40.000	29.2	v	13.6	42.8	74.0	-31.2

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

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Electromagnetic Engineering Services, Incorporated
FCC, Part 87 (Section 2.993) Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: Cubic Communications
EUT: HF Exciter, Amp, Power Supply (4MHz, J3E mode)
Model #: T-4180, PA-5050A, PS-7130A

Conducted by: 
Date of Test: 02-11-98
Test Distance, Amp. gain: 10 m, 0 dB

Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for 10 m (dBuV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
4.000	31.5	v	33.8	65.3	146.9	-81.6
8.000	1.9	v	30.3	32.2	74.0	-41.8
12.000	6.9	v	31.5	38.4	74.0	-35.6
16.000	1.3	v	25.6	26.9	74.0	-47.1
20.000	35.9	v	26.7	62.6	74.0	-11.4
24.000	19.9	v	27.2	47.1	74.0	-26.9
28.000	16.3	v	29.3	45.6	74.0	-28.4
32.000	13.6	v	14.8	28.4	74.0	-45.6
36.000	20.8	h	13.9	34.7	74.0	-39.3
40.000	14.9	v	13.6	28.5	74.0	-45.5

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

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Electromagnetic Engineering Services, Incorporated
FCC, Part 87 (Section 2.993) Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: Cubic Communications
EUT: HF Exciter, Amp, Power Supply (3MHz, J3E mode)
Model #: T-4180, PA-5050A, PS-7130A

Conducted by: 
Date of Test: 02-11-98
Test Distance, Amp. gain: 10 m, 0 dB

Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for 10 m (dBuV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
3.000	34.2	v	33.0	67.2	146.9	-79.7
6.000	0.6	v	29.7	30.3	74.0	-43.7
9.000	0.6	v	30.8	31.4	74.0	-42.6
12.000	0.6	v	31.5	32.1	74.0	-41.9
15.000	0.6	v	25.2	25.8	74.0	-48.2
18.000	1.2	v	26.0	27.2	74.0	-46.8
21.000	15.4	v	26.9	42.3	74.0	-31.8
24.000	17.7	v	27.2	44.9	74.0	-29.1
27.000	17.6	h	28.7	46.3	74.0	-27.8
30.000	12.3	v	15.3	27.6	74.0	-46.4

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

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Electromagnetic Engineering Services, Incorporated
FCC, Part 87 (Section 2.993) Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: Cubic Communications
EUT: HF Exciter, Amp, Power Supply (3MHz, H3E mode)
Model #: T-4180, PA-5050A, PS-7130A

Conducted by: 
Date of Test: 02-11-98
Test Distance, Amp. gain: 10 m, 0 dB

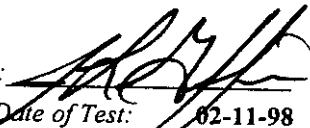
Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for 10 m (dBμV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
3.000	36.2	v	33.0	69.2	146.9	-77.7
6.000	0.5	v	29.7	30.2	74.0	-43.8
9.000	0.5	v	30.8	31.3	74.0	-42.7
12.000	0.5	v	31.5	32.0	74.0	-42.0
15.000	0.5	v	25.2	25.7	74.0	-48.3
18.000	-0.8	v	26.0	25.2	74.0	-48.8
21.000	14.3	v	26.9	41.2	74.0	-32.9
24.000	17.0	h	27.2	44.2	74.0	-29.8
27.000	15.6	v	28.7	44.3	74.0	-29.8
30.000	9.5	v	15.3	24.8	74.0	-49.2

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

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Electromagnetic Engineering Services, Incorporated
FCC, Part 87 (Section 2.993) Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: Cubic Communications
EUT: HF Exciter, Amp, Power Supply (2MHz, J3E mode)
Model #: T-4180, PA-5050A, PS-7130A

Conducted by: 
Date of Test: 02-11-98
Test Distance, Amp. gain: 10 m, 0 dB

Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for 10 m (dBuV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
2.000	30.9	v	37.7	68.6	146.9	-78.3
4.000	3.2	v	33.8	37.0	74.0	-37.0
6.000	1.7	v	29.7	31.4	74.0	-42.6
8.000	-0.4	v	30.3	29.9	74.0	-44.1
10.000	1.0	v	31.0	32.0	74.0	-42.0
12.000	1.0	v	31.5	32.5	74.0	-41.5
14.000	1.0	v	24.7	25.7	74.0	-48.3
16.000	-1.4	v	25.6	24.2	74.0	-49.8
18.000	-0.8	v	26.0	25.2	74.0	-48.8
20.000	7.8	v	26.7	34.5	74.0	-39.5

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

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8.8 Frequency Stability Test Results (\$2.995)

Electromagnetic Engineering Services, Incorporated FCC, Part 87, Sec. 2.995, Voltage Input Variation Data Sheet

Client: Cubic Communications
EUT: HF Exciter, Amp, Power Supply
Model #: T-4180, PA-5050A, PS-7130A

Conducted by: 
Date of Test: 12/19/97
(Frequency = 24.9MHz, CW mode)

Power Type	208 Input Power Mode (VAC)	Frequency (Hz)	115 Input Power Mode (VAC)	Frequency (Hz)
Nominal Power	208 VAC	24899995.6	115 VAC	24899994.4
Low Power	176 VAC	24899995.6	97 VAC	24899994.4
High Power	240 VAC	24899995.4	133 VAC	24899994.2
Nominal Power	208 VAC	24899995.2	115 VAC	24899994.2

Conclusion: The frequency deviated less than 10 Hz from nominal in all modes
Test Engineer: _____

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Electromagnetic Engineering Services, Incorporated
FCC, Part 87, Sec. 2.995, Frequency Stability Data Sheet

Client: Cubic Communications
EUT: HF Exciter, Amp, Power Supply
Model #: T-4180, PA-5050A, PS-7130A

Conducted by: 
Date of Test: 12-18-97
(Excitation at 1500Hz)

Temp. (C)	Frequency (Hz) CW	Frequency (Hz) J3E Mode	Frequency (Hz) H3E Mode
-30.0	24900005.4	24901505.4	24900005.4
-20.0	24900004.2	24901504.2	24900004.2
-10.0	24900003.4	24901503.4	24900003.4
0.0	24900002.8	24901502.8	24900002.8
10.0	24901001.2	24901501.2	24900001.2
20.0	24900001.2	24901501.2	24900001.2
30.0	24899996.8	24901497.0	24899997.2
40.0	24899995.8	24901495.8	24899995.8
50.0	24899999.0	24901499.2	24899999.0

Conclusion: The frequency deviated less than 10 Hz from nominal in all modes

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APPENDIX A

EESI'S TEST EQUIPMENT & TEST FACILITIES CALIBRATION PROGRAM

EESI operates a comprehensive equipment calibration program in order to ensure the validity of all test data. EESI's calibration program is fully compliant to the requirements of ANSI/NCSL Z540-1 (1994) and of ISO 10012-1 (1993-05-01). EESI's calibration program therefore meets or exceeds the US national commercial and military requirements (N.B. ANSI/NCSL Z540-1 (1994) replaces MIL-STD-45662A) and meets the requirements of ISO-9000. Specifically, all of EESI's primary reference standard devices (e.g., resistor and capacitor decade boxes, vector voltmeters, multimeters, attenuators and terminations, RF power meters (and their detector heads), oscilloscope mainframes and plug-ins, spectrum analyzers, RF preselectors, quasi-peak adapters, interference analyzers, impulse generators, signal generators and pulse/function generators, etc.) and certain secondary standard devices (e.g., RF preamplifiers used in CISPR 11/22 and FCC Part 15/18 tests) are calibrated by EESI-approved independent (third party) metrology laboratories, using NIST-traceable standards. In all cases, the metrology laboratory furnishes EESI with Certificates Of Calibration on each item of equipment that has been successfully recalibrated.

Calibration intervals are normally one year, except when the manufacturer advises a shorter interval (e.g., the HP 8568B Spectrum Analyzer is recalibrated every 6 months) or if US Government directives demand a shorter interval (e.g., the Eaton 533X-11 Impulse Generator is required to be recalibrated every six months for use in TEMPEST testing). Items of equipment which fail during routine use, or which suffer visible mechanical damage (during use or while in transit), are sidelined pending repair and recalibration. (Repairs are carried out either by the EESI-approved independent (third party) metrology laboratories, or by the manufacturer of the equipment.

EESI typically determines the Antenna Factors in its test antennas in-house. Antennas used for CISPR 11, CISPR 22, and FCC Part 15 and Part 18 Radiated Emissions testing (and for testing to the European Norms) are calibrated against NIST-traceable, FCC-approved Roberts™ Dipoles, using the methods specified in both Annex G.5 of CISPR 16-1 (1993) and ANSI C63.5 (1991), including the "Three-Antenna Method." Certain other antennas (e.g., log-conic spirals) are calibrated using the procedures specified in SAE ARP-958A. In accordance with FCC regulations, EESI recalibrates its suite of antennas used for FCC tests on an annual basis. These calibrations are performed as a precursor to the FCC-required annual revalidation of the Normalized Site Attenuation properties of EESI's Open Area Test Site¹. In those instances where antennas are acquired directly from the manufacturer, EESI will purchase an Antenna Factor Calibration Data Package. Finally, EESI may send antennas out to NIST-traceable/military-approved independent antenna range laboratories, or to the original equipment manufacturer.

¹ EESI uses the procedures contained in both Subclause 16.6 and Annex G.2 of CISPR 16-1 (1993), and ANSI C63.4 (1992) when performing Normalized Site Attenuation measurement for calibration of EESI's Open Area Test Site.